International Abstracts of Surgery

MAY 1961

VOLUME 112
NUMBER 5

Collective Review

THE PRESERVATION OF WHOLE BLOOD

WALTER F. BALLINGER II, M.D., F.A.C.S., and HERBERT E. COHN, M.D.,
Philadelphia, Pennsylvania

THE PROBLEMS associated with hemorrhage and blood replacement have received much consideration. However, the surgical literature contains relatively few references to the methods used for the collection, storage, and processing of blood. In recent years, notable progress has been made in this field and this review is intended to summarize these advances and to point out some of the lines of research presently being conducted. No effort will be made to review the extensive literature regarding indications for transfusion or recommendations as to total amounts of blood required.

Investigations associated with the collection and storage of whole blood are chiefly concerned with three major problems: anticoagulation, surfaces, and storage temperature.

ANTICOAGULATION

Citrate. Sodium citrate had been a useful anticoagulant in the laboratory for many years prior to 1915 when Lewisohn (69) in New York and Agote (3) in Buenos Aires suggested that blood could be collected in the presence of this substance, stored for several days, and used for human transfusion. Lewisohn indicated that sodium citrate in small amounts was sufficiently nontoxic so that 2,500 milliliters of whole blood containing 0.2 per cent citrate could safely be given at one time (70). This quantity of blood was at that time (1916) considered more than adequate for the replacement of any acute blood loss. However, as all surgeons are aware, the scope of surgery has increased and since whole blood is more commonly used to replace massive blood loss the problem of citrate intoxication has had to be reappraised. The earlier methods of collection and storage of whole blood have recently been reviewed by Lewisohn (71, 72).

In 1944, Adams and his co-workers (2) investigated the subject of citrate intoxication by means of hemorrhage and retransfusion experiments in dogs. By analogy, they concluded that it would be necessary to transfuse 4,000 milliliters of citrated whole blood in 5 minutes to a 70 kilogram man in order to produce citrate intoxication. These investigators also pointed out that the toxicity of citrate was due to its effect in binding the ionized serum calcium. They believed that citrate intoxication would not occur in clinical practice simply because of the volume of citrated blood necessary to produce it. On the other hand, sporadic reports had been published by that time, and continued to appear thereafter, of cases in which citrate intoxication was the presumed cause of death. For example, Dodd, Minot, and Bryan (32) in 1933 described an infant who had received sodium citrate by

From the Department of Surgery, Jefferson Medical College, Philadelphia, Pennsylvania.

mouth followed by a citrated blood transfusion. Death occurred after an episode of bradycardia and respiratory arrest.

Meanwhile, exchange transfusions became an accepted procedure in the treatment of neonatal infants with erythroblastosis fetalis. Wallerstein (116) in 1947 was the first to point out the dangers of citrate intoxication in this work and suggested the use of calcium replacement. In 1949, Wexler and others (127) studied a mongoloid infant with no liver disease and 8 erythroblastotic infants; the ability of the latter to remove citrate was impaired. All the infants except one, however, were able to metabolize citrate at least as rapidly as it was infused. The one exception, in whom the disease process was most severe, showed progressively higher citrate acid levels throughout the transfusion and died in 24 hours. Furman, Hellerstein, and Startzman (44) in 1951 described the electrocardiographic changes occurring during the course of exchange transfusion and noted that they were identical with those of ionized serum calcium deficiency; namely, prolongation of the QT interval, lengthening of the ST segment, and a decreased amplitude of the T wave. These electrocardiographic changes were accompanied by fine skeletal muscle tremors. There was a dramatic reversal in the electrocardiograms after calcium administration, even to the point of early hypercalcemia. The authors suggested the dangers of excess calcium therapy. These findings were confirmed and amplified by Gustafson (54).

Other case reports have appeared in which death during transfusion or shortly thereafter seemed to have been caused by citrate intoxication. This conclusion was based upon knowledge of the amount of citrate infused (10) or upon determinations of citrate made upon blood withdrawn from the cardiac chambers at death (102). Ames, Syllm, and Rapoport (8) implicated the infusion of citrated plasma in one death and one near fatality in infants, basing their conclusions on plasma citrate levels and electrocardiographic changes.

High plasma citrate levels were found by Ludbrook and Wynn (75) in 4 patients receiving transfusions of citrated whole blood, with one death presumably due to citrate intoxication. They demonstrated a linear relationship between the rate of infusion of citrate and the rise in the plasma citrate level in normal humans and dogs. For each milligram of citrate infused per kilogram per minute, the rise was about 20 milligrams per 100 milliliters in dogs and 12.5 milligrams per 100 milliliters in humans. Furthermore, they estimated that 20 per cent of the infused citrate was excreted in humans by the kidneys, the remainder being destroyed by metabolic pathways, chiefly in the liver. The authors estimated on the basis of these data that the human transfusion of 540 milliliters of citrated whole blood in 5 minutes was unlikely to cause a dangerous rise in plasma citrate, provided that the recipient could metabolize citrate at a normal rate.

Other authors have listed varying rates of safe transfusion. Adams and others (2), as mentioned, suggested up to 4,000 milliliters in 5 minutes to a 70 kilogram man; Gardner (46), 5,000 milliliters per hour. Bunker (24), basing his calculations upon considerable experimental and clinical data, stated that 500 milliliters of whole blood administered to a 70 kilogram man in 15 minutes can elevate the serum citrate considerably but not dangerously if the metabolic pathways for destruction and excretion are not impaired. He warned, however, that citrate intoxication can and does occur if the rate is more rapid or if the transfusion is continued at this rate.

The difference between such estimates of various investigators appears, at first, confusing until one recalls that throughout the years differing quantities of citrate have been employed as an anticoagulant in whole blood transfusions. At first, sodium citrate, trisodium citrate, and citric acid were used singly or in various combinations. Later, dextrose was added as an agent to prolong the life of the red blood cells. Caramelization occurred at the temperatures required for sterilization, so that further modifications of the anticoagulant-preservative solution were required (73). At present, there are two solutions in common use in this country, designated as National Institutes of Health ACD Formula A and ACD Formula B. Their constituents are as follows:

National Institutes of Health Formula A	
Dextrose	2.45 gm.
Citric acid	0.80 gm.
Trisodium citrate	2.2 gm.
per each 100 ml. water	
National Institutes of Health Formula B	
Dextrose	1.47 gm.
Citric acid	0.44 gm.
Sodium citrate	1.32 gm.
per each 100 ml. water	

Other solutions containing citrate are under investigation but as yet have not been used widely. Gibson and his co-workers (50,52) have described a citrate-phosphate-dextrose solution (CPD) which appears to decrease the damage to the cells during collection of the blood and which contains less citrate than the ACD solution. Multiple infusions of blood collected with CPD solution did not significantly raise plasma phosphate levels or depress serum calcium levels. The initial p_H of CPD preserved blood was 7.20 as opposed to 7.00 for ACD blood (51). Peeters (89) has attempted to replace citrate with lactate, which is a less powerful anticoagulant but also a less toxic natural metabolite.

An important factor in the development of citrate intoxication has been suggested; namely, the ability of the recipient to metabolize and excrete the infused citrate. Since citrate is mainly metabolized in the liver, intrinsic hepatic disease or any situation which prevents citrate from reaching the liver tends to allow dangerously high citrate levels to result during periods of rapid citrate infusion. Such situations are encountered during shunting operations for portal hypertension secondary to cirrhosis. Procedures which call for temporary occlusion of the thoracic aorta, as is necessary in the resection of certain aneurysms, may be accompanied by dangerously high serum citrate levels during massive blood replacement. Bunker (24) has shown the concentration of citrate in the serum to be approximately 2 milligrams per cent in normal individuals and that in banked blood to vary between 250 milligrams per cent and 400 milligrams per cent depending on the composition and quantity of ACD solution used. This author has observed serum citrate concentration as high as 72 milligrams per cent or 12 milliequivalents per liter in blood obtained from patients after transfusion, enough to depress the calculated ionized calcium to 0.7 milliequivalents per liter from a normal of 2.0 milliequivalents per liter. This is more than sufficient to produce cardiac standstill in animal preparations.

High levels of serum citrate have been observed during transfusions given to patients under hypothermia; here the mechanism is explained on the basis of a generalized metabolic slowing due to lowered body temperature (24, 52, 75). Since hypothermia is often employed during operations in which total circulatory arrest or occlusion of certain portions of the circulation is utilized (11, 17), danger of citrate intoxication increases.

The question of a derangement in the clotting mechanism secondary to the infusion of citrate has been investigated on several occasions. Since the citrate is administered as an anticoagulant in whole blood, it is quite natural that it has been implicated in cases of generalized oozing during surgical procedures when large quantities of whole blood have been infused. Bunker (24) stated that "the potential toxic effects of citric acid are, for all practical purposes, entirely secondary to the binding of ionized calcium . . . eventually, the heart no longer beats and the blood no longer clots." That the cardiac effects occur before a serious derangement in clotting mechanism appears has been demonstrated repeatedly (58, 67, 78). It is possible that hypocalcemia in association with other defects in the coagulation mechanism may contribute to oozing at the time of operation; nevertheless, the hypocalcemia secondary to high citrate levels in the blood is probably not in itself a predominant cause of bleeding (24). Recently, Winchell and associates (128) were able to produce severe hypocalcemia in dogs by the passage of blood across an ion exchange column, but in no case did bleeding ensue.

The response of both animals and humans to the infusion of citrated and noncitrated whole blood after hemorrhage has been studied. In a series of articles, Nakasone and others (86, 124) showed that dogs subjected to a graduated blood loss exhibited a marked decrease in circulatory tolerance to infused citrate. Cookson, Costas-Deirieux, and Barkey (30) described experiments of a similar nature, but went on to show that the mortality was reduced if heparinized blood rather than citrated blood were used. Firt and Hejhal (38) demonstrated a rise in pulmonary arterial pressure during intravenous citrate administration, and concluded that there was a resultant increase in peripheral venous pressure together with cardiac overloading and eventual cardiac failure. When larger doses were used, these investigators noted a depression of myocardial activity, potentiated by the high potassium content of stored whole blood. It is, perhaps, this effect which explains the poor tolerance of dogs to citrated blood after hemorrhage.

The various clinical and experimental effects of citrate infusion having been reviewed, it would be well to describe the syndrome of citrate intoxication (2, 25). In an unanesthetized individual, as the level of ionized calcium in the serum falls, skeletal muscle tremors develop and elec-

trocardiographic changes occur (116). Later, the blood pressure falls suddenly and does not respond to further or more rapid whole blood transfusion, but does respond rather dramatically to the administration of calcium chloride or calcium gluconate. Except in infants undergoing exchange transfusion, one would rarely see such a clinical course. Since most massive transfusions are given to patients who are under anesthesia and who often are already hypotensive due to severe blood loss, the clinical picture is altered. Anesthesia abolishes the early signs of tetany and it may be difficult to determine whether the hypotension is due to inadequate blood replacement or to the administration of excess citrate.

Although citrate intoxication is probably a rare complication, one should be aware of its possibility under certain circumstances, especially if hypotension due to blood loss fails to respond to repeated transfusions of citrated whole blood. The surgeon should recognize especially the possibility of overdosage when the metabolic destruction of citrate is reduced, as during hypothermia, thoracic aortic occlusion, inflow occlusion of the liver, intrinsic hepatic disease, and, possibly, renal disease.

It has become common practice to give calcium in association with a predetermined number of 500 milliliter units of citrated whole blood. Bunker (24) demonstrated the transient nature of such single shot therapy and warned of the dangers of calcium overdosage, although the importance of the latter effect has been minimized by Guynn and Reynolds (55). If citrate intoxication is suspected, Bunker has recommended that 0.5 gram of calcium chloride be given as a diagnostic test. This should produce a prompt, though brief, rise in blood pressure. After this, he suggests that calcium chloride in a 1 per cent solution, 1 gram per 150 pounds body weight, be given in 10 to 15 minutes as a priming dose, then 1 gram per hour. This procedure results in a constant elevation in serum calcium to protect against high citrate levels yet, presumably, not high enough to produce hypercalcemia with increased cardiac irritability and eventual ventricular fibrillation. One must recall the synergistic action of calcium and digitalis and be aware of the dangers of sudden large increases in serum calcium in digitalized patients (102). In an editorial in Lancet (36) it was recently pointed out that awareness of the risk of citrate poisoning should go far to reduce deaths from this cause, but in addition, there should be a wider recognition of the risks of blood transfusion: the sooner bleeding is stopped, the smaller is the amount of blood that has to be transfused.

Ion exchange resins. Another method of rendering blood incoagulable, which has received considerable attention in the last decade, utilizes ion exchange resins to remove calcium from the blood, usually replacing this ion with sodium. It is not generally recognized that this use of resins was first described in 1944 by Steinberg (105) who noted minimal cellular or chemical changes in the blood after its passage across the sodium cycle resin column. The resin used was inexpensive and could be regenerated and re-employed innumerable times. However, no further work was published on this subject until 1951 when Walter (117) used an ion exchange column to remove the calcium ion. He stated that the avoidance of toxic anticoagulants, including the citrate radical, is essential for optimal preservation of the formed elements and the chemical integrity of the plasma. This investigator used a sodium cycle, dowex -50, ion exchange resin. Case (26) used a cation exchange resin in an attempt to decalcify ribs in the preparation of bone marrow samples. The resin was used in addition to other decalcifying substances and did not significantly aid in the removal of calcium. Macaulay and Watson (77), using a cation exchange resin, presumably administered by rectum, described the development of tetany in 3 children with nephrosis. They stated, however, that all 3 were in a state of chronic calcium deficiency and the use of the resins was just enough to tip the balance and produce tetany. Chollet and others (29) confirmed the work of Walter in the preparation of decalcified blood. However, they noted that the sodium cycle cation exchange resin used in their experiments was not very effective in removing calcium from citrated blood, a result which they ascribed to the formation of a calcium citrate bond.

Curiously, very little work has been reported on the removal of excess citrate from bank blood until recently. Nealon noted a significant removal of citrate after passage through a chloride cycle, dowex 1 x 8, anion exchange resin (87). The level of citrate in canine blood, freshly drawn into ACD solution, Formula A, was 470 milligrams per cent and after 21 days of storage was 476.2 milligrams per cent. After passage of the blood across the ion exchange column, the

citrate level was reduced to 51 milligrams per cent. Similar results have also been obtained with human stored whole blood (79).

Heparin. This active mammalian anticoagulant, first isolated in crude form by McLean in 1916 (80), was purified by Charles and Scott in 1933 (28). Excellent historical reviews of the development of heparin may be found in a monograph by Jorpes (61) and in an article by Best (15). Here was a nontoxic substance which could be injected into an animal or human to render the blood incoagulable. Quite rapidly, investigators began to report its use to prevent thrombosis in humans. Sköld (100) first suggested in 1936, however, that a known quantity of heparin could be placed in a container to which donor blood could be added. The blood could then be maintained without clotting and transfused into a recipient without the danger of excess citrate administration. Gibbon (48), in one of the earliest reports of the experimental use of a heart-lung machine in 1937, used heparinized cat blood for transfusion purposes and Murray (84) in an editorial on the uses of heparin stated that he had employed this agent as an anticoagulant for human transfusions.

With the development of extracorporeal blood circuits such as are used in the artificial kidney and the heart-lung machine, heparin became the anticoagulant of choice since the introduction of large quantities of the citrate ion could be avoided. In addition, Westover, Habif, and Scudder (126) suggested the use of heparinized blood with dextrose added in certain cases in which citrate could not be rapidly metabolized. Many clinics with extensive experience in the use of a mechanical heart-lung apparatus have described their procedures for the collection, storage, and the use of heparinized blood (1, 49). Quite recently, Senning (99) has suggested somewhat higher dosages than those previously used. To avoid excess heparin and the rapid loss of cellular elements, the blood is generally preserved for only one day before use.

The circulating heparin in the body is usually neutralized with protamine sulfate when the use of the extracorporeal circuit is terminated. In 1937, Chargaff and Olson demonstrated that the administration of protamine to a previously heparinized animal reduced the clotting time to normal (27). Allen and his co-workers devised a protamine titration test (6), which has since been modified and which allows an estimation of heparin activity. Such in vitro methods are necessary since it has been impossible so far to develop a rapid, accurate method of assaying heparin directly. Warren and Wysocki (123) have recently compared various methods of heparin measurement; they found that a carefully performed coagulation time test of the blood gave a more accurate clinical appraisal than the other indirect method of heparin assay used. There is considerable importance in estimating the quantity of circulating heparin since protamine given in correct amounts will neutralize it and return the clotting times to normal. Excess protamine, on the other hand, acts as an anticoagulant itself and can produce a serious coagulation defect, probably as a result of an antiprothrombic and antithromboplastic action (57, 110). Allen (4) has suggested that a milligram of protamine sulfate be injected for each milligram of heparin previously administered. This amount will be sufficient to neutralize the circulating heparin except in the presence of thrombocytopenia when a somewhat altered dosage schedule is suggested.

Another drug, polybrene, with pronounced antiheparin effects has been described by Preston (92, 93). Since 1952, an increasing number of reports have appeared, chiefly from centers utilizing heart-lung machines, emphasizing the need for a reliable method of neutralizing heparin in open heart surgery. Anderson, Mendelow, and Alfano (9) compared the effect of protamine and polybrene in dogs and found no significant difference between the two. On the other hand, Blumberg and his associates (19) studied the antiheparin effects of protamine in a series of 50 patients who underwent open heart operations and compared this group to a subsequent series of 47 patients in whom polybrene was used to neutralize heparin. They concluded that polybrene was superior to protamine because of its increased stability, its apparently more rapid action, the apparently greater margin of safety between the antiheparin effect and the anticoagulant effect, the more uniform potency of the preparation, and the absence of severe hypotensive effects.

Within the past year, Amatuzio, Grande, and Hay (7) have described experiments on an acidic phospholipid isolated from the blood of man and animals and the fresh liver of animals. When given to heparinized animals, this compound returned the clotting times to normal

within 10 to 20 minutes. This preliminary report indicates the presence of a long searched for heparin antagonist that occurs in the normal mammalian tissues. Further reports are awaited with interest.

Ethylenediamine tetra-acetic acid (EDTA). In 1942, Dyckerhoff, Marx, and Ludwig (35) published the results of their search for more powerful anticoagulants. They were the first to demonstrate the effective action of ethylenediamine tetra-acetic acid upon the coagulation mechanism of the blood. The salts of this acid—usually sodium in clinical usage—have been widely investigated since Dyckerhoff's original report. The most remarkable property of these salts is their ability to form strong unionized soluble chelate complexes with numerous divalent cations (96). This property has been utilized extensively in clinical practice (16), especially as a treatment for lead poisoning (14) and as a chelating agent for the binding of various harmful radioisotopes after accidental injection (40). Foreman and Trujillo (42) studied the metabolism of EDTA in humans using C^{14} labelling techniques. They found that the calcium chelate passes through the body unchanged and is excreted rapidly by the kidneys by both glomerular filtration and tubular secretion. The substance does not appear to penetrate erythrocytes. It is virtually nontoxic as demonstrated by the tremendously wide range between the therapeutic dose and the median lethal dose. Recently, a few reports have been published describing the appearance of renal tubular damage (34, 41) after the use of this chelating agent. It should be noted, however, that the dosages employed in treating these patients were high and the therapy prolonged. There appears to be little, if any, danger connected with the use of EDTA as an anticoagulant when administered to patients.

Prior to 1951, EDTA was used primarily as a laboratory anticoagulant for in vitro determinations and was found to be compatible with many of the current chemical and hematologic procedures in routine use (64). Popovici and his associates (91) suggested that the agent could be used experimentally in the regulation of serum calcium levels. Also, about this time, it was becoming well recognized that one of the advantages of EDTA was its ability to preserve cellular elements of blood longer than other anticoagulants. Dillard, Brecher, and Cronkite (31) first described their method for the separation, concentration, and transfusion of platelets using EDTA in 1951. This method, with modifications, has become the accepted manner of collecting platelets.

At approximately the same time, Proescher (94) noted that the di-sodium salt of EDTA could be added to a 5 per cent glucose solution for anticoagulation and preservation of whole blood. The combination did not caramelize when sterilized. Twenty human transfusions with no ill effects were reported. Sprague and others (104) confirmed this work, using the same concentrations of EDTA-Na_2 and glucose, and found the posttransfusion survival of erythrocytes preserved in this fashion to be comparable to that of blood collected in ACD solution.

Studies by Zucker (129) and Mustard (85) suggested that there was a marked destruction of accelerator globulin, factor V, and plasma antihemophilic globulin when EDTA was added to whole blood. Zucker thought that the anticoagulant properties of this agent might more likely be due to this effect than to calcium binding. She further suggested that the magnesium ion might be removed from the plasma in addition to calcium, resulting in the observed Ac-globulin loss. Leikin and Bessman (68) confirmed this loss of a metallic ion other than calcium but indicated that magnesium was not involved. In a later article (130), Zucker and Borrelli showed that those metal chelates of EDTA which have a stability constant higher than calcium fail to act as anticoagulants. On the other hand, magnesium and barium EDTA prevent clotting of the blood. Extensive studies were carried out upon the coagulation factors involved and upon platelet morphology and the investigators concluded that the magnesium ion may normally be responsible for maintaining a short thrombin time, for preventing changes in platelet disc shape and adhesiveness, and for slowing accelerator globulin destruction. These conclusions have been generally accepted. A further note of caution was expressed by Bishop and Richardson (18) who reported a distinct coagulant action when only small quantities of calcium were chelated with EDTA in blood. They suggested that calcium inhibitors used to prevent blood clotting should not be used in inadequate amounts. In addition, these investigators warned that these anticoagulants

should not be used if loss of activity of these agents during the storage of blood were anticipated. Sacker and others (98) recently confirmed the finding that the various EDTA salts are better able to preserve the cellular elements of the blood than other anticoagulants and, as mentioned, this is particularly applicable to the thrombocytes.

Edglugate-Mg. Heparin as an anticoagulant of blood in the massive transfusions required in extracorporeal circuits has been discussed. That this is not ideal is well known to all workers in this field because of the small clots which begin to form in this blood 24 to 36 hours after collection. Brown and Smith (22, 23) and Smith, Brown, Young, and Sealy (103) attempted to obviate the need for blood collection shortly before use in cases requiring a pump-oxygenator apparatus. A new anticoagulant-preservative mixture was developed containing di-sodium ethylenediamine tetra-acetate as the anticoagulant, glucose as the preservative, sodium gluconate to enhance preservation of red blood cells, and magnesium chloride to prevent or inhibit inactivation of accelerator globulin by EDTA. The mixture was composed of: 0.410 gram disodium ethylenediamine tetra-acetate dihydrate, 0.364 gram anhydrous sodium gluconate, 0.0305 gram magnesium chloride hexahydrate, 1.50 gram dextrose, and q.s. ad 30.0 milliliters water. The authors observed that blood for extracorporeal circulation could be stored in this mixture with good platelet preservation for 3 to 5 days before operation. Immediately before use in a circulatory bypass operation, 15 milligrams of heparin are added to each 500 milliliters of the blood edglugate-Mg mixture, followed by a calcium chloride solution containing 1.67 millimoles of Ca++. Actually, 1.1 millimoles of Ca++ will restore the ionized calcium level of the blood to normal, since the authors found that 1.1 millimoles of disodium EDTA was adequate for anticoagulation of 500 milliliters of blood. The excess Ca++ was used in view of the development of increased potassium content of the blood during storage. Potassium leakage from the red blood cells is at about double the rate found in ACD stored blood. This is admitted by the investigators to be the most serious defect of the mixture. If the blood is not to be used in a pump oxygenator circuit, heparin and calcium chloride are not added, and the mixture may be stored at 1 to 4 degrees C. and transfused as late as 20 days with evidence of 73 per cent viability of the erythrocytes as opposed to 78 per cent with an ACD mixture. In the absence of sodium gluconate, these investigators noted increased hemolysis between the second and third week of storage.

ACD, calcium, and heparin. Within the past few months, Foote, Trede, and Maloney (39) have published their results in the use of ACD blood for patients undergoing operations in which extracorporeal circulation is utilized. As has been mentioned, one of the problems involved in such operations is the necessity of using large volumes of blood, principally for priming the extracorporeal circuit. If ACD blood is used, rather large concentrations of citrate are infused. On the other hand, if heparinized blood is used, it cannot be stored for convenient periods of time. Foote and his co-workers have indicated that it is feasible to convert ACD blood by the addition of calcium and heparin. In their preliminary report, it was suggested that somewhat higher doses of heparin are required for anticoagulation because of an antiheparin effect resulting from the addition of calcium.

SURFACES

It has been recognized for more than 75 years that the surface of vessels used as blood containers affects the clotting of blood. Freund (43) in 1888, and Bordet and Gengou (20, 21) in 1903 and 1904 demonstrated that clotting was delayed by surfaces coated with vaseline or paraffin. Since then it has been assumed that contact of the blood with a wettable surface is an important factor initiating clotting. The development and widespread use of the silicones in industry led to the discovery of their nonwettable properties. These are polymeric substances derived from organic silicon compounds which present a hemorepellant surface. In 1946, Jaques and his associates (60) found that blood placed in silicone-coated glass took considerably longer to clot than when it was contained in uncoated glass. In addition, they observed less agglutination and disintegration of the platelets. A variety of uses for silicone-coated glassware in the laboratory was reviewed by Gilbert in 1951 (53). Turner and associates (113) noted a better yield of serum with less hemolysis when blood was allowed to clot in silicone-treated test tubes. Rice's suggestion (96) of the use of silicone-treated needles in blood donation constituted

an advance in the collection of undamaged blood. He noted that clotting often began within the lumen of the needle. Another refinement was made by Walter (117) in 1950, when he introduced a laminar flow needle with a smooth inner bore from end to end which prevented turbulence and thus avoided activation of the prothrombin mechanism. Walter and his associates (118, 122) have emphasized the importance of the use of large caliber needles in order to maintain the flow of blood with less danger of coagulation and have reviewed the many factors which tend to promote clotting in the needle.

The polyvinyl plastic container with plastic tubing and the laminar flow needle described by Walter (117) was a completely closed system. Incorporated within it was a column of sodium cycle cation exchange resin to remove calcium, thus avoiding the use of anticoagulants. It was hoped thus to approach the ideal criteria of "a nonwettable, chemically inert, nonreactive, glossy surface," resulting in delayed coagulation and less deterioration of the stored blood. Subsequently, the literature has contained a number of articles describing modifications of this apparatus or reporting the results of storage of whole blood or its derivatives. Since the empty collapsible containers are lighter in weight and occupy less room, the logistic advantages to the military services and civilian defense organization have been stressed (66).

Muether, Sommer, and Koster (83) noted that the rate of deterioration of blood over a comparable period of time was about the same whether glass or plastic containers were used. In 1952, Walter and Murphy (121) modified the apparatus by removing the cation exchange column and adding the ACD solution to the plastic collection bag. Using this equipment, Sack, Gibson, and Buckley (97) noted that 70 to 80 per cent of infused erythrocytes retained their normal functional capacity after storage up to 25 days. However, Wall and his associates (114, 115) noted that red cells survived better in glass containers than in plastic containers supplied by two different manufacturers. Strumia (106), in a review of this problem in 1954, agreed that plastic containers were not superior to glass and that nonwettable surfaces in general offered no advantages as far as erythrocyte preservation was concerned. However, he stressed the great logistic advantages of plastic containers and urged that further efforts be made in their development. One year later, in 1955, Strumia, Colwell, and Ellenberger (108) re-evaluated plastic blood containers; this time they showed survival of erythrocytes was somewhat greater than when glass containers were used. They commented that the plastic used in their earlier work was of the same manufacturer's lot as that used by Wall. They concluded that it was almost impossible to obtain exact information about the nature of the plastic material, plasticizers, stabilizers, mold release agents, fungicides, and detergents used in the manufacture of the bags. Thus, until more standardization occurred, equivocal data would result regarding the ultimate fate of erythrocytes stored in containers made of plastics.

Walter, Button, and Ritts (119) defined the criteria of the ideal plastic to be used for the storage of whole blood: It should not leach toxic ingredients into the blood, it should have a low vapor transmission rate, it should be resistant to penetration by bacteria and fungi, it should be hemorepellent, and it should exhibit heat stability. The original equipment with the cation exchange column permitted a comparable red cell survival equivalent to glass storage without an added nutrient, such as dextrose. Adaptation of the ACD technique of preservation yielded an average erythrocyte survival of 84 per cent after 21 days' storage at 5 degrees C. Walter, Knudsin, and Button (120) cultured 4,497 plastic bags containing whole blood. The contamination rate was found to be 1 per cent, or one-sixth that of glass containers. Meanwhile, a group of British investigators (33) evaluated the same type of containers as used by Walter and found that the posttransfusion survival of erythrocytes was not improved by storage in plastic bags; they concluded that these containers possessed no real advantages over glass for routine use.

Thus, the reports regarding the usefulness of plastic containers over glass in reference to erythrocyte survival are conflicting. Strumia, as stated, has indicated the difficulty in obtaining standardization of the materials used in preparation of plastic bags. Recently, Strumia, Colwell, and Dugan (107) outlined these problems more specifically. They noted that polyvinyl chloride is plasticized with dioctyl sebacate which may exert a toxic effect upon red blood cells, but suggested that this effect may be eliminated by

the use of a proper stabilizer such as one containing zinc. They further noted that this problem of leachable toxic materials is common to both plastics and glass, describing the solubility of silicates from glass at the *p*H of stored whole blood. Thus, it is evident that the ideal container has not yet been found; all exert a certain deleterious effect upon the blood.

Plastic equipment is useful in obtaining suspensions of platelets, using di-sodium EDTA as the anticoagulant (47). There appears to be no question that platelets are preserved for longer periods in plastic than in glass and that the use of laminar flow needles and plastic tubing prevents agglutination and destruction. Klein and his associates (65) have indicated a similar advantage of plastic containers in the collection of leukocyte concentrates.

STORAGE

The standard method of blood storage today entails mixing the blood in an ACD solution for anticoagulation and preservation followed by refrigeration up to 21 days at a temperature of 4 degrees C. The refrigeration of blood at this temperature effectively retards cellular metabolism. The addition of ACD solution with a *p*H of 5.5 lowers the *p*H of the blood to approximately 7.0, thereby markedly interfering with optimal activity of most of the enzyme systems within the cells. During the period of storage certain changes occur within the erythrocytes. There is a progressive inhibition of glycolytic activity due to the intracellular accumulation of lactic acid and the *p*H falls. There is continued breakdown of organic phosphates with the liberation of inorganic phosphate and a release of potassium from the cells with an associated uptake of sodium and water by the cells (88). These changes result in a net increase in intracellular osmotic pressure, producing a progressive swelling of the erythrocytes with eventual rupture.

The risk of homologous serum jaundice after the administration of whole blood transfusions is well known. Its incidence is usually reported at less than 1 per cent, but Katz and his colleagues (62) reported an incidence of 4.16 per cent in a carefully studied group of 144 recipients of whole blood transfusions. Hoxworth, Haesler, and Smith (59) reported an incidence of 0.6 per cent in 3,349 recipients receiving over 7,000 units of whole blood. Allen and his associates (5) reported a 1.4 per cent incidence of serum hepatitis in a sample group representative of more than 11,000 recipients of whole blood transfusions. They also found an increase in the incidence of serum hepatitis as the number of transfusions increased from one through five, but no further increase thereafter. The incidence of serum hepatitis was also found to be seven to ten times greater after transfusion of blood from professional donors as compared to transfusion of blood from family donors. Bang and his associates (12) recently observed that the serum glutamic oxalacetic transaminase (SGOT) level is a good index of former viral hepatitis. The incidence of serum hepatitis was three to four times greater in individuals receiving whole blood in which the SGOT level exceeded 100 units as compared to those receiving blood with a normal SGOT level.

With the advent of open heart surgery and the use of cardiopulmonary bypass, the need for large quantities of pooled multiple whole blood transfusions has become commonplace. There is little, if any, evidence to date that an increased incidence of homologous serum jaundice has followed these procedures.

In order to reduce the risk of serum hepatitis after whole blood transfusion, certain principles should be followed. First, unnecessary whole blood transfusions should be avoided. Next, when multiple transfusions are required, donors should be restricted to family and friends, avoiding if at all possible the use of the paid professional donor. Also, all donors should be carefully screened and questioned about a previous history of jaundice. Routine measurement of the SGOT level may prove of value in eliminating those with a questionable or unknown history of viral hepatitis.

The major disadvantage of the present method of blood storage is the short period of time, 21 days, during which whole blood can be safely stored. Recently, much work has been directed toward increasing the storage period without altering the formed elements of blood and without appreciably affecting red cell survival.

It has been known for many years that the freezing of biologic material results in the formation of ice crystals and death of the cells. Ice crystal formation may occur both intracellularly and extracellularly depending upon the rate of freezing. Slow freezing between the temperatures of 0 and −40 degrees C. is characterized by the formation of ice crystals in the extracellular phase. Although it was once thought that these

crystals destroyed the cell by their size or shape, the theory generally accepted today was proposed by Lovelock in 1953 (74). When ice crystals form during freezing that is, when water changes from the liquid to the solid phase, available water is withdrawn and the proteins and the lipids within the cells become exposed to increasing concentrations of salt. When a critical salt concentration is reached, known as the eutectic point, the proteins and lipids become denatured, dissolved, or precipitated producing irreversible cell damage and death. In mammalian red blood cells the cell membrane is permeable to water. It is necessary for these cells to remain in osmotic equilibrium with the surrounding medium while freezing progresses. Therefore, a high concentration of salt may be damaging with either intracellular or extracellular ice crystal formation. In order to prevent cell destruction during slow freezing, the amount of water removed for ice formation must be small enough so that the salt concentration does not rise to a damaging level. Ice crystals also form during rapid freezing; for the most part this occurs within the cells. Thus, with this method also it is necessary to prevent excessively high salt concentrations. In addition, the formation of large intracellular ice crystals leads to mechanical destruction of the cell. Luyet and Gehenio (76) observed that cell destruction does not occur if protoplasm is converted into the vitreous state during cooling with intracellular ice formation. They suggested that this be accomplished by rapid supercooling since the critical temperature for cellular death fell within the range of temperatures during which ice crystals formed, 0 to −40 degrees C. They also noted that partial dehydration of protoplasm prior to rapid cooling or warming provided an additional protective effect.

The discovery in 1949 by Polge, Smith, and Parkes (90) that glycerol provided a remarkable protective effect on fowl spermatozoa exposed to the damaging effects of freezing at −79 degrees C. provided impetus to the development of successful red cell preservation at these extremely reduced temperatures. It was found that a variety of living cells can survive slow cooling to temperatures between −79 and −190 degrees C. in the presence of glycerol. The effect of glycerol is in binding water, making it unavailable for ice formation. Even in high concentrations glycerol is nontoxic and has no adverse effect on cellular enzymes. In spite of its high viscosity, water and electrolytes diffuse into it rapidly and it diffuses rapidly into other solutions (101).

These fundamental facts provide the basis for the glycerol method of red cell preservation. The technique involved is essentially as follows (63, 111, 112): Blood is collected in plastic bags containing ACD solution and plasma is separated in the Cohn centrifuge. Glycerol is then added to the cell suspension in a gradient from 0 to 50 per cent weight per volume over a 45 minute period. The cells are transferred to another plastic bag for storage. The bags have been stored at −80 and −120 degrees C. reaching the final temperature in about 7 hours. Storage has been maintained at these temperatures for periods up to 28 months. Thawing is accomplished by immersion of the plastic bags in water at 37 degrees C. The removal of glycerol is carried out by dialysis against saline. The blood is then ready for transfusion. After the transfusion of 125 units of cells prepared in this fashion, no untoward reactions were noted. Over 1,000 units of frozen, glycerolized blood have been transfused with good clinical results and a low reaction rate (56). The choice of 50 per cent glycerol was based on a series of experiments which showed that in solutions of this concentration there was minimal cell loss as measured by hemolysis. The glycerol must be removed after the thawing of the specimen, not because of any inherent toxicity but because the rate of water endosmosis is roughly four times as great as glycerol exosmosis (81). Without deglycerolization when the cells were transferred to an aqueous medium such as plasma, rapid hemolysis would occur since water would rush into the cells faster than glycerol would rush out.

With this technique, the rate of freezing and thawing requires minimal controls. Both processes can be carried out in a single plastic pack under sterile conditions. For long storage low temperatures are required but brief exposure to elevated temperatures, as for transportation or in case of power failure, can be tolerated without appreciable loss of viable red cells. One disadvantage of this system of red cell preservation is that the addition and removal of glycerol are time consuming and require the use of expensive equipment. However, recent techniques require only 45 minutes for glycerolization and 90 minutes for deglycerolization (37, 63). The major disadvantage of this technique is that

plasma is lost before and during the addition of glycerol. Also, the mechanical manipulation of erythrocytes increases the possibility of hemolysis and the percentage of nonviable cells. However, approximately 80 per cent of the cells can be recovered by this method.

Another major advance in red cell preservation has been the development of the rapid freezing technique in which blood is almost immediately cooled to −40 degrees C. or below. The blood will thus pass the eutectic point without crystallization and the resulting cellular damage. Large ice crystal formation is avoided and with the formation of microcrystals, the critical concentration of electrolytes which is damaging to the cell is prevented. However, in order to prevent coalescing of these microcrystals into macrocrystals, the blood must be stored at a temperature much below −40 degrees C. In addition, rapid thawing is necessary to prevent damage from crystal growth and denaturation. Therefore, extremely rapid cooling to low temperature storage and extremely rapid thawing are the criteria for success with the rapid freezing method. Ordinarily, 15 to 20 per cent hemolysis is produced in blood stored in this manner. In order to reduce the degree of hemolysis, the velocity of ice crystal growth must be reduced. The addition of glucose, urea, or sodium citrate has proved effective in this connection. In concentrations of 1 to 5 per cent, these compounds increase the recovery of red cells by this method to 98 per cent.

Meryman (81) has described a technique for rapid freezing with a high degree of red cell survival. ACD blood is equilibrated with a 5 per cent solution of glucose. The blood is then passed through fine capillary tubes onto the surface of liquid nitrogen and freezing results in approximately 1 second. The blood sinks to the bottom of the nitrogen and can be recovered in the form of fine sand. Storage is at a temperature below −70 degrees C. and preferably below −100 degrees C. for indefinite preservation. Thawing is carried out by sifting the frozen material into warm saline or plasma. Ten milliliters of saline or plasma are sufficient to thaw 1 pint of blood. The glucose need not be removed and the blood is ready for transfusion. The obvious advantage of this type of blood storage is that it provides whole blood rather than just red cells for transfusion. The major disadvantage is that special equipment is necessary for processing and for maintaining sterility. Also, strict, unvaried temperature controls are required.

Strumia and his colleagues (109) have used the rapid freezing technique on blood equilibrated with 0.2 molar lactose, 0.7 molar dextrose, or a 0.6 molar solution of lactose and dextrose combined. Blood was stored in flat containers of thin aluminum or tin plated copper with a 3 millimeter inside thickness. Freezing was accomplished by immersion in a carbon dioxide-ethanol mixture at −60 to −70 degrees C. and thawing by immersion in physiologic saline solution at 37 degrees C. Again, the optimal cooling time from 0 to −40 degrees C. was found to be less than 10 seconds. Recovery of red blood cells was 95 per cent whereas, without the protection provided by the lactose and dextrose, red cell recovery was only 29 per cent. The survival rate was found to be directly affected by the storage temperature, diminishing as temperatures rose toward −40 degrees C. Increasing the thickness of the containers resulted in a decreased percentage of red cell recovery. However, the container dimensions may be increased without a loss of cells if the concentration of the additives is raised (81). Leukocytes and platelets were also found to be present in these preparations but their viability was not determined. Weiss and Ballinger (126) have demonstrated the feasibility of collecting and storing platelets at −79 degrees C. using a 30 per cent glycerol saline solution. The platelets retained their morphologic characteristics and clot retracting ability, an indication of continued viability. A later study indicated the optimal glycerol concentration to be somewhat less than 30 per cent (13).

The addition of certain materials to ACD solution rather than changing the physical properties of blood per se has been investigated. Gabrio, Donohue, and Finch in 1955 (45) showed that the addition of adenosine to stored red blood cells results in a rapid reconstitution of cellular composition and metabolic capacity. Adenosine triphosphate and organic phosphate esters are resynthesized. Potassium re-enters the cell and sodium leaves the cell with a concomitant loss of water and decrease in cellular volume. The pathway for this so-called rejuvenation of the cell is as follows (88): The nucleotide entering the cell undergoes phosphorolysis producing ribose which is then converted to lactate

and adenosine triphosphate by way of the pentose metabolic pathway. The degree of regeneration never quite reaches normal and the ability of the cell to utilize its normal substrate, glucose, remains impaired, since hexokinase activity is not restored. Neufeld and his associates (88) have stated that adenosine and guanosine are toxic because they liberate ammonia and therefore are unsuitable for reconstitution of cellular composition. These investigators recommended that inosine be used as a means of rejuvenating 21 day old blood by restoring the adenosine triphosphate reserve and cell viability practically to normal. The final disposition by the body of the uric acid formed from this purine is not known. Mollison and Robinson (82) stated, however, that the adenosine triphosphate content of red cells is not maintained as well in blood stored in ACD solution with inosine added as it is in blood stored in ACD with adenosine added and believe, therefore, that adenosine is more efficient in retaining or restoring red cell viability.

SUMMARY

1. The three major problems associated with the preservation of whole blood are anticoagulation, surfaces, and storage temperature. A brief historical outline and a summary of recent advances in each of these areas has been presented.

2. Acid-citrate-dextrose is still the most widely used anticoagulant-preservative solution. The question of citrate intoxication has been reviewed. There appears to be little danger from the use of the citrate ion as an anticoagulant except under unusual circumstances as outlined.

3. Recent investigations and clinical usage of heparin, ethylenediamine tetracetic acid, ion exchange resins, edglugate-Mg, and other anticoagulant combinations have been reviewed.

4. The development of surfaces less damaging to whole blood has been outlined with special reference to silicone coating and plastic containers.

5. Newer methods of storage of whole blood include the addition of a nucleotide, adenosine, in order to lengthen the period of erythrocyte survival. In addition, storage at temperatures below −79 degrees C. has permitted almost indefinite survival of red blood cells. The mechanisms for its accomplishment are discussed.

REFERENCES

1. Abbott, J. P., Cooley, D. A., DeBakey, M. E., and Ragland, J. E. Storage of blood for open heart operations. Surgery, 1958, 44: 698.
2. Adams, W. E., Thornton, T. F., Jr., Allen, J. G., and Gonzales, D. E. The danger and prevention of citrate intoxication in massive transfusions of whole blood. Ann. Surg., 1944, 120: 656.
3. Agote, L. Nuevo procidimiento para le transfusion del sangre. An. Inst. clín. méd., B. Air., 1915, Jan.
4. Allen, J. G. Problems and Questions on Coagulation of Blood Arising from the Use of Extracorporeal Circulation. Springfield, Illinois: Charles C Thomas, 1958.
5. Allen, J. G., Dawson, D., Sayman, W. A., Humphreys, E. M., Benham, R. S., and Havens, I. Blood transfusions and serum hepatitis; Use of monochloroacetate as an antibacterial agent in plasma. Ann. Surg., 1959, 150: 455.
6. Allen, J. G., Moulder, P. V., Elghammer, R. M., Grassman, B. J., McKeen, C. L., Sanderson, M., Egner, W., and Crosbie, J. M. A protamine titration as an indication of a clotting defect in certain hemorrhagic states. J. Laborat. Clin. M. 1949, 34: 473.
7. Amatuzio, D. S., Grande, F., and Hay, L. J. A natural occurring lipid that neutralizes heparin activity in blood. Abstr. of presentation at Annual Meet. Soc. of University Surgeons, Minneapolis, Minnesota, Feb. 11, 1960.
8. Ames, R., Syllm, I., and Rapoport, S. Effect of infusions of citrated plasma on the plasma citrate level of infants. Pediatrics, 1950, 6: 361.
9. Anderson, M. N., Mendelow, M., and Alfano, G. A. A comparative study of heparin neutralization and the danger of blood clotting abnormalities with protamine and polybrene. J. Thorac. Cardiovasc. Surg., 1960, 39: 613.
10. Argent, D. E. Citrate intoxication following a rapid massive blood transfusion. Brit. J. Anaesth., 1957, 29: 136.
11. Ballinger, W. F., II, Weiss, A. J., and Blanc, K. E.: Variations in the technique of platelet preservation at −79°C. Surgical Forum; Clinical Congress 1958. Vol. IX, p. 132. Chicago: American College of Surgeons, 1959.
12. Bang, N. U., Ruegsegger, P., Ley, A. B., and LaDue, J. S. Detection of hepatitis carriers by serum glutamic oxalacetic transaminase activity. J. Am. M. Ass., 1959, 171: 2303.
13. Bernhard, W. F., McMurray, J. D., and Curtis, G. W. Feasibility of partial hepatic resection under hypothermia. N. England J. M., 1955, 253: 159.
14. Bessman, S. P., Ried, H., and Rubin, M. Treatment of lead encephalopathy with calcium disodium versenate; report of case. Med. Ann. District of Columbia, 1952, 21: 312.
15. Best, C. H. Heparin and thrombosis. Brit. M. J., 1938, 2: 977.
16. Bidstrup, P. L. Calcium disodium versenate. Practitioner, Lond., 1957, 179: 314.
17. Bigelow, W. G. Hypothermia. Surgery, 1958, 43: 683.
18. Bishop, J. G., and Richardson, A. W. The diphasic actions of ceanothyn and EDTA as blood coagulants. J. Am. Pharm. Ass., Scient. Ed., 1957, 46: 337.
19. Blumberg, J. B., Winterscheid, L. C., Dillard, D. H., Vetto, R. V., and Merendino, K. A. The clinical use of polybrene as an antiheparin agent in open heart surgery. J. Thorac. Cardiovasc. Surg., 1960, 39: 330.

20. BORDET, J., and GENGOU, O. Recherches sur la coagulation du sang. Ann. Inst. Pasteur, Par., 1903, 17: 822.
21. Idem. Recherches sur la coagulation du sang; contribution a l'etude due plasma fluore. Ann. Inst. Pasteur, Par., 1904, 18: 26.
22. BROWN, I. W., JR., and SMITH, W. W. Hematologic problems associated with the use of extracorporeal circulation for cardiovascular surgery. Ann. Int. M., 1958, 49: 1035.
23. Idem. Blood transfusion problems associated with extracorporeal circulation and a new blood anticoagulant-preservative mixture for this purpose. Biblioth. Haemat., 1959, 10: 15.
24. BUNKER, J. P. Citric acid intoxication. Biblioth. Haemat., 1958, 7: 69.
25. BUNKER, J. P., STETSON, J. B., COE, R. C., GRILLO, H. C., and MURPHY, A. J. Citric acid intoxication J. Am. M. Ass., 1955, 157: 1361.
26. CASE, N. M. The use of a cation exchange resin in decalcification. Stain Techn., 1953, 28: 155.
27. CHARGAFF, E., and OLSON, K. B. Studies on chemistry of blood coagulation; studies on action of heparin and other anticoagulants. Influence of protamine on anticoagulant effect in vivo. J. Biol. Chem., 1937, 122: 153.
28. CHARLES, A. F., and SCOTT, D. A. Studies on heparin: I. The preparation of heparin. J. Biol. Chem., 1933, 102: 425.
29. CHOLLET, H. A., CLAUSS, R. H., GIANNINI, S. G., and MACFEE, W. F. A safe and simple method of blood collection for transfusion utilizing a cation exchange resin. Ann. Surg., 1958, 147: 69.
30. COOKSON, B. A., COSTAS-DEIRIEUX, J., and BARKEY, C. P. The toxic effects of citrated blood and the search for a suitable substitute for use in cardiac surgery. Ann. Surg., 1954, 139: 430.
31. DILLARD, G. H. L., BRECHER, G., and CRONKITE, E. P. Separation, concentration, and transfusion of platelets. Proc. Soc. Exp. Biol., N.Y., 1951, 78: 796.
32. DODD, K., MINOT, A. S., and BRYAN, R. Chemical action of sodium citrate as cause of certain transfusion reactions. Am. J. Dis. Child., 1933, 45: 32.
33. DUDLEY, H. A., MCNAIR, T. J., RICHMOND, J., PATON, B. C., and CUMMING, R. A. Plastic bags for storing and transfusing blood. Lancet, Lond., 1958, 1: 294.
34. DUDLEY, H. R., RITCHIE, A. C., SCHILLING, A., and BAKER, W. H. Pathologic changes associated with use of sodium ethylene diamine tetra-acetate in treatment of hypercalcemia; Report of 2 cases with autopsy findings. N. England J. M., 1955, 252: 331.
35. DYCKERHOFF, H., MARX, A., and LUDWIG, B. Ueber den Wirkungsmechanismus und die Verwendlarkeit einiger blutgerinnungshemmender organischer Substanzen. Zschr. ges. exp. Med., 1942 110: 412.
36. Editorial. Transfusion of citrated blood. Lancet, Lond., 1957, 2: 1152.
37. ENGELFRIED, J. The present status of storage and survival of blood components in military service. Proc. VII Congr. Internat. Soc. Blood Transfusion. Basel: S. Karger, 1959.
38. FIRT, P., and HEJHAL, L. Treatment of severe hemorrhage. Lancet, Lond., 1957, 2: 1132.
39. FOOTE, A. V., TREDE, M., and MALONEY, J. V., JR. The use of stored acid-citrate-dextrose (ACD) blood for clinical extracorporeal circulation. Surgical Forum; Clinical Congress 1960. Vol. XI, p. 230. Chicago: American College of Surgeons, 1960.
40. FOREMAN, H. Use of chelating agents for accelerating excretion of radio elements. J. Am. Pharm. Ass., Scient. Ed., 1953, 42: 629.
41. FOREMAN, H., FINNEGAN, C., and LUSHBAUGH, C. L. Nephrotoxic hazard from uncontrolled edathamil calcium-disodium therapy. J. Am. M. Ass., 1956, 160: 1042.
42. FOREMAN, H., and TRUJILLO, T. T. The metabolism of C^{14} labeled ethylenediamine tetra-acetic acid in human beings. J. Laborat. Clin. M., 1954, 43: 566.
43. FREUND, E. Ueber die Urasache der Blutgerinnung. Wien. med. Jahrb., 1888, 3: 259.
44. FURMAN, R. A., HELLERSTEIN, H. K., and STARTZMAN, V. V. Electrocardiographic changes occurring during the course of replacement transfusion. J. Pediat., S. Louis, 1951, 38: 45.
45. GABRIO, B. W., DONOHUE, D. M., and FINCH, C. A. Erythrocyte preservation—V, Relationship between chemical changes and viability of stored blood treated with adenosine. J. Clin. Invest., 1955, 34: 1509.
46. GARDNER, F. H. Problems of multiple transfusions. California M., 1958, 88: 93.
47. GARDNER, F. H., HOWELL, D., and HIRSCH, E. O. Platelet transfusions utilizing plastic equipment. J. Laborat. Clin. M., 1954, 43: 196.
48. GIBBON, J. H., JR. Artificial maintenance of circulation during experimental occlusion of pulmonary artery. Arch. Surg., 1937, 34: 1105.
49. Idem. Extracorporeal Maintenance of Cardiorespiratory Functions. The Harvey Lectures. New York: Academic Press, 1959.
50. GIBSON, J. G., II, and MCMANUS, T. J. Further progress in blood preservation. Proc. VI Cong. Internat. Soc. Blood Transfusion Basel: S. Karger, 1958.
51. GIBSON, J. G., II, REES, S. B., and MCMANUS, T. J. Replacement of blood loss during surgical procedures with blood collected in citrate phosphate dextrose solution. N. England J. M., 1960, 262: 595.
52. GIBSON, J. G., II, REES, S. B., MCMANUS, T. J., SCHEITLIN, W. A. A citrate-phosphate-dextrose solution for the preservation of human blood. Am. J. Clin. Path., 1957, 28: 569.
53. GILBERT, P. T., JR. Silicone water repellents for general laboratory use. Science, 1951, 114: 637.
54. GUSTAFSON, J. E. Electrocardiographic changes in exchange transfusions. J. Pediat., S. Louis, 1951, 39: 593.
55. GUYNN, V. L., and REYNOLDS, J. T. The use and abuse of blood transfusions. Surg. Clin. N. America, 1958, 38: 19.
56. HAYNES, L. L., TULLIS, J. L., PYLE, H. M., SPROUL, M. T., WALLACH, S., and TURVILLE, W. C. Clinical use of glycerolized frozen blood. J. Am. M. Ass., 1960, 173: 1657.
57. HOUGIE, C. Anticoagulant action of protamine sulfate. Proc. Soc. Exp. Biol., N.Y., 1958, 98: 130.
58. HOWLAND, W. S., BELLVILLE, J. W., ZUCKER, M. B., BOYAN, P., and CLIFTON, E. E. Massive blood replacement—V, Failure to observe citrate intoxication. Surg. Gyn. Obst., 1957, 105: 529.
59. HOXWORTH, P. I., HAESLER, W. E., JR., and SMITH, H., JR. The risk of hepatitis from whole blood and stored plasma. Surg. Gyn. Obst., 1959, 109: 38.
60. JAQUES, L. B., FIDLAR, E., FELSTED, E. T., and MACDONALD, A. G. Silicones and blood coagulation. Canad. M. Ass. J., 1946, 55: 26.
61. JORPES, J. E. Heparin in the Treatment of Thrombosis. Ed. 2. London: Oxford University Press, 1946.

62. KATZ, R., DUCCI, H., BENNETT, H., and RODRIGUEZ, J. Incidence of hepatitis following transfusions of whole blood. Am. J. Clin. Path., 1957, 27: 406.
63. KETCHEL, M. M., TULLIS, J. L., TINCH, K. J., DRISCOLL, S. G., and SURGENOR, D. M. The use of biomechanical equipment for the long term preservation of erythrocytes. J. Am. M. Ass., 1958, 168: 404.
64. KLAPHEKE, M. A., and RUBIN, M. Sodium ethylene diaminetetracetate as an anticoagulant for routine laboratory procedures. Bull. Georgetown Univ. Med. Center, 1951, 5: 33.
65. KLEIN, E., ARNOLD, P., EARL, R. T., and WAKE, E. Simple methods for the aseptic separation of blood components. Biblioth. Haemat., 1958, 7: 382.
66. KNUDTSON, K. P. Plastic blood containers. Am. J. Clin. Path., 1953, 23: 813.
67. KREVANS, J. R., and JACKSON, D. P. Hemorrhagic disorder following massive whole blood transfusions. J. Am. M. Ass., 1955, 159: 171.
68. LEIKIN, S., and BESSMAN, S. P. The effects of various EDTA complexes on coagulation. Blood, N.Y., 1956, 11: 916.
69. LEWISOHN, R. A new and greatly simplified method of blood transfusion; a preliminary report. Med. Rec., N.Y., 1915, 87: 141.
70. Idem. The importance of the proper dosage of sodium citrate in blood transfusion. Ann. Surg., 1916, 64: 618.
71. Idem. Blood transfusion: 50 years ago and today. Surg. Gyn. Obst., 1955, 101: 362.
72. Idem. The citrate method of blood transfusion in retrospect. Surgery, 1958, 43: 325.
73. LOUTIT, J. F., MOLLISON, P. L., and YOUNG, I. M. Citric acid-sodium citrate-glucose mixtures for blood storage. Q. J. Exp. Physiol., Lond., 1943, 32: 183.
74. LOVELOCK, J. E. Biophysical Aspects of the Freezing of Living Cells in the Preservation of Normal Tissues for Transplantation. Boston: Ciba Foundation Symposium, 1953.
75. LUDBROOK, J., and WYNN, V. Citrate intoxication, A clinical and experimental study. Brit. M. J., 1958, 2: 523.
76. LUYET, B. J., and GEHENIO, P. M. Life and death at low temperatures. Biodynamica, Normandy, Mo., 1940.
77. MACAULAY, D., and WATSON, G. H. Tetany following cation-exchange resin therapy. Lancet, Lond., 1954, 2: 70.
78. MAYER, A. The relationship of bleeding and clotting times to massive transfusions of citrated blood. Surgery, 1953, 33: 79.
79. MCLAUGHLIN, E., NEALON, T. F., JR., and GIBBON, J. H., JR. Removal of citrate preservative and accumulated anions from bank blood. To be published.
80. MCLEAN, J. The thromboplastic action of cephalin. Am. J. Physiol., 1916, 41: 250.
81. MERYMAN, H. T. An investigation into the preservation of whole blood by freezing. Mil. Med., 1957, 121: 261.
82. MOLLISON, P. L., and ROBINSON, M. A. Enhanced survival of stored red cells. Brit. J. Haemat., 1959, 5: 331.
83. MUETHER, R. D., SOMMER, A. J., and KOSTER, B. Studies on blood stored in plastic bags. Am. J. Clin. Path., 1953, 23: 818.
84. MURRAY, D. W. G. Some experimental and clinical aspects of the use of heparin. Surg. Gyn. Obst., 1940, 70: 246.
85. MUSTARD, J. F. Some in vitro effects of various concentrations of disodium ethylenediamine tetraacetate, potassium oxalate, and sodium citrate on coagulation of blood. Am. J. Clin. Path., 1958, 30: 498.
86. NAKASONE, N., WATKINS, E., JANEWAY, C. A., and GROSS, R. E. Experimental studies of circulatory derangement following massive transfusion of citrated blood. J. Laborat. Clin. M., 1954, 43: 184.
87. NEALON, T. F., JR. Discussion of W. W. Smith, I. W. Brown, Jr., W. G. Young, Jr. and W. C. Sealy (103).
88. NEUFELD, A. H., BAMCILLON, M., HILL, S. A., and DENSTEDT, O. F. The survival of Cr^{51} tagged inozine-preserved erythrocytes in man. Proc. VII Congr. Internat. Soc. Blood Transfusion. Basel: S. Karger, 1959.
89. PEETERS, H. Sodium lactate as a preservative for whole blood. Bibl. Haemat., 1958, 7: 293.
90. POLGE, C., SMITH, A. U., and PARKES, A. S. Revival of spermatozoa after vitrification and dehydration at low temperatures. Nature, Lond., 1949, 164: 666.
91. POPOVICI, A., GESCHICKTER, C. F., REINOVSKY, A., and RUBIN, M. Experimental control of serum calcium levels in vivo. Proc. Soc. Exp. Biol., N.Y., 1950, 74: 415.
92. PRESTON, F. W. The antiheparin effect of polybrene. J. Laborat. Clin. M., 1952, 40: 929.
93. PRESTON, F. W., and PARKER, R. P. New antiheparin agent "polybrene." Arch. Surg., 1953, 66: 545.
94. PROESCHER, F. Anticoagulant properties of ethylene bis-iminodiacetic acid. Proc. Soc. Exp. Biol., N.Y., 1951, 76: 619.
95. PROESCHER, F., and NOLAN, J. Progress in blood preservation. California M., 1954, 81: 221.
96. RICE, W. G. Report on the use of silicone-treated needles in blood donation. Am. J. Clin. Path., 1948, 18: 752.
97. SACK, T., GIBSON, J. G., and BUCKLEY, E. S., JR. The preservation of whole ACD blood collected, stored, and transfused in plastic equipment. Surg. Gyn. Obst., 1952, 95: 113.
98. SACKER, L. S., SAUNDERS, K. E., PAGE, B., and GOODFELLOW, M. Dilithium sequestrene as an anticoagulant. J. Clin. Path., 1959, 12: 254.
99. SENNING, A. Plasma-heparin concentration in extracorporeal circulation. Acta. chir. scand., 1959, 117: 55.
100. SKÖLD, E. Heparin bei bluttransfusion. Acta med. scand., 1936, 88: 450.
101. SMITH, A. U. Effects of low temperatures on living cells and tissues. In Harris, R. J. C. Biological Applications of Freezing and Drying. New York: Academic Press, 1954.
102. SMITH, R. M. Blood replacement in thoracic surgery for children. J. Am. M. Ass., 1956, 161: 1124.
103. SMITH, W. W., BROWN, I. W., JR., YOUNG, W. G., JR., and SEALY, W. C. Studies of edglugate-Mg: A new donor blood anticoagulant-preservative mixture for extracorporeal circulation. J. Thorac. Cardiovasc. Surg., 1959, 38: 573.
104. SPRAGUE, C. C., SHAPLEIGH, J. B., MAYES, S., LANGE, R. D., and MOORE, C. V. Posttransfusion survival of erythrocytes stored in a solution of ethylenediamine tetracetic acid and dextrose. J. Laborat. Clin. M., 1953, 41: 84.
105. STEINBERG, A. A new method for preventing blood coagulation. Proc. Soc. Exp. Biol., N.Y., 1944, 56: 124.

106. STRUMIA, M. M. The preservation of blood for transfusion. Blood, N.Y., 1954, 9: 1105.
107. STRUMIA, M. M., COLWELL, L. S., and DUGAN, A. The preservation of blood for transfusion—III, Mechanism of action of containers on red blood cells. J. Laborat. Clin. M., 1959, 53: 106.
108. STRUMIA, M. M., COLWELL, L. S., and ELLENBERGER, K. The preservation of blood for transfusion—I, The effect of plastic containers on red cells. J. Laborat. Clin. M., 1955, 46: 225.
109. STRUMIA, M. M., COLWELL, L. C., and STRUMIA, P. V. Preservation of whole blood in frozen state for transfusion. Science, 1959, 128: 1002.
110. TOCANTINS, L. M. Cephalin, protamine, and antithromboplastic activity of normal and hemophilic plasmas. Proc. Soc. Exp. Biol., N.Y., 1943, 54: 94.
111. TULLIS, J. L. Red cell preservation. Proc. VII Congr. Internat. Soc. Blood Transfusion. Basel: S. Karger, 1959.
112. TULLIS, J. L., KETCHEL, M. M., PYLE, H. M., PENNELL, R. B., GIBSON, J. G., II, TINCH, R. J., and DRISCOLL, S. G. Studies on the in vivo survival of glycerolized and frozen red blood cells. J. Am. M. Ass., 1958, 168: 399.
113. TURNER, R. D., LAWLESS, M. C., CLEARY, E., and FRENCH, E. M. Use of silicone tested test tubes to obtain serum from blood. Am. J. Clin. Path., 1949, 19: 296.
114. WALL, R. L., BUCKLEY, N. M., and DOAN, C. A. Evaluation of preservation of human blood stored in experimental plastic containers; in vivo studies. J. Laborat. Clin. M., 1953, 42: 674.
115. WALL, R. L., SHINOWARA, G., BOURAMCLE, B., and DE LEEUW, N. K. M. Evaluation of the preservation of human blood stored in experimental plastic containers—I, In vitro studies. J. Laborat. Clin. M., 1953, 42: 665.
116. WALLERSTEIN, H. Substitution transfusion: A new treatment for severe erythroblastosis foetalis. Am. J. Dis. Child., 1947, 23: 19.
117. WALTER, C. W. A new technic for collection, storage, and administration of unadulterated whole blood. Surgical Forum; Clinical Congress 1950. Vol. I, p. 483. Philadelphia: W. B. Saunders Co., 1951.
118. WALTER, C. W., BELLAMY, D., and MURPHY, W. P., JR. The mechanical factors which are responsible for rapid infusion of blood. Surg. Gyn. Obst., 1955, 101: 115.
119. WALTER, C. W., BUTTON, L. N., and RITTS, R. E., JR. An evaluation of human blood processed in plastic transfusion equipment. Surg. Gyn. Obst., 1957, 105: 365.
120. WALTER, C. W., KNUDSIN, R. B., and BUTTON, L. B. New technic for detection of bacterial contamination in a blood bank using plastic equipment. N. England J. M., 1957, 257: 364.
121. WALTER, C. W., and MURPHY, W. P., JR. A closed gravity technique for the preservation of whole blood in ACD solution utilizing plastic equipment. Surg. Gyn. Obst., 1952, 94: 687.
122. WALTER, C. W., MURPHY, W. P., JR., JESSIMAN, A. G., and O'HARA, R. M. A study of the retardation of clotting of whole blood on contact with stainless steel. Surgical Forum; Clinical Congress 1951. Vol. II, p. 289. Philadelphia: W. B. Saunders Co., 1952.
123. WARREN, R., and WYSOCKI, A. Assay of heparin in blood: A critique. Surgery, 1958, 44: 435.
124. WATKINS, E., JR. Experimental citrate intoxication during massive blood transfusion. Surgical Forum; Clinical Congress 1953. Vol. IV, p. 213. Philadelphia: W. B. Saunders Co., 1954.
125. WEISS, A. J., and BALLINGER, W. F., II. The feasibility of storage of intact platelets with apparent preservation of function. Ann. Surg., 1958, 148: 360.
126. WESTOVER, J. H., HABIF, D. V., and SCUDDER, J. Heparin-dextrose preserved blood for blood transfusion. Surgical Forum; Clinical Congress 1950. Vol. I, p. 530. Philadelphia: W. B. Saunders Co., 1951.
127. WEXLER, I. B., PINCUS, J. B., NATELSON, S., and LUGOVOY, J. K. The fate of citrate in erythroblastotic infants treated with exchange transfusion. J. Clin. Invest., 1949, 28: 474.
128. WINCHELL, H. S., GOLLUB, S., EHRLICH, E., and WIN, A. W. Thrombocytopenia and hypocalcemia; A new method for their production in dogs and an evaluation of their significance in abnormal bleeding. Surgery, 1958, 45: 357.
129. ZUCKER, M. B. Some effects of disodium ethylene diaminetetracetate on blood coagulation. Am. J. Clin. Path., 1954, 24: 39.
130. ZUCKER, M. B., and BORRELLI, J. Some effects of divalent cations on the clotting mechanism and the platelets of EDTA blood. J. Appl. Physiol., 1958, 12: 453.

ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

EYES

Chymotrypsin in Various Ophthalmic Surgical Procedures. WENDELL L. HUGHES, EARL L. LEWIS, and JOSEPH AMDUR. *Am. J. Ophth.*, 1961, 51: 103.

THE AUTHORS evaluate the systemic administration of chymotrypsin as a routine proteolytic, anti-inflammatory agent in a variety of ocular surgical procedures. One of the most useful group of enzymes is the proteolytic, of which trypsin and chymotrypsin are best known.

Proteolytic enzyme therapy is based upon the premise that absorption of an inflammatory exudate is delayed by the blockage of capillaries and lymphatics with large protein complexes found in and around any area of injury as part of the normal inflammatory response. These proteins, because of their large size, dam the lymphatics and capillaries, delaying absorption of the edema and inflammatory debris. Trypsin and chymotrypsin digest complex proteins into smaller, easily absorbed carbon fragments so that lymphatics and capillaries are cleared of these proteins and fluid is withdrawn from the area of inflammation.

In a series of 115 consecutive ophthalmic surgical cases, 1 c.c. of aqueous chymotrypsin was administered intramuscularly at the conclusion of the surgical procedure, and a second c.c. was given intramuscularly on the following day using a 21 gauge needle. In 66 per cent of the muscle cases, 50 per cent of the plastic cases, and 33.3 per cent of the lens cases the postoperative inflammatory reaction was less than average. The greatest anti-inflammatory effect was manifested in multiple muscle surgery particularly that of the inferior oblique. It was also quite noticeable in intraocular surgery. Oral chymotrypsin and buccal preparations are also being evaluated in various ophthalmic surgical procedures.

—Joshua Zuckerman, M.D.

Alpha Chymotrypsin in Cataract Surgery. DERMOT PIERSE and H. N. O'DONOGHUE. *Brit. M. J.*, 1960, 2: 1629.

THIS REPORT covers 65 cataract operations performed by the authors' team at the Croydon Eye Unit, Croydon, England between June and December 1958. Alpha chymotrypsin was injected into the posterior chamber in each case and comparison studies are cited from other series of the authors and from related literature. Vitreous loss occurred in 1 case and the capsule ruptured in 4. Immediate complications were iris prolapse, 1; mild striate keratitis, 4; hyphema, 7; iritis, 2; severe keratitis, 1; and delayed wound healing, 1.

Corneal edema is more apt to occur in the presence of pre-existing endothelial edema. The authors have abandoned injections behind the iris at 6 o'clock in order to minimize possible endothelial trauma from the instillation cannula. Postoperative appearance of pigment dispersal was more common—50 per cent of cases—with the use of chymotrypsin at operation but seemed of no significance in relation to healing or vision. Slit lamp studies of the vitreous face through 1959 revealed no altered incidence of vitreous face holes, vitreous herniation, or free vitreous in the anterior chamber as compared to other series by the authors. The enzyme definitely weakens zonular resistance and makes lens extraction easier. Visual results compared favorably to the authors' previously published figures when not using chymotrypsin. Vitreous opacities seemed to occur in a slightly higher percentage of cases than when the enzyme was omitted.

—Arthur H. Keeney, M.D.

Aspiration of Congenital or Soft Cataracts: A New Technique. HAROLD G. SCHEIE. *Am. J. Ophth.*, 1960, 50: 1048.

SCHEIE points out that many techniques have been advocated for the management of congenital cataract: iridectomy for optical reasons, discission, linear extraction, aspiration, Ziegler through-and-through discission, and intracapsular extraction. He describes a modified technique for aspiration of congenital cataracts or soft cataracts regardless of cause in individuals under 30 years of age. The operation is performed with general anesthesia in infants and children and with local anesthesia in older patients. A specially made thin walled oval tip No. 19 gauge needle is inserted through a scleral puncture made by a knife needle 5 mm. behind the limbus. If the lens is not completely cataractous a preliminary capsulotomy is performed to allow softening of the lens by the aqueous. Within 2, 3, or more days the lens becomes completely opaque and it can be aspirated easily leaving little or no lens material. Maximum pupillary dilatation is obtained preoperatively by 1 per cent atropine sulfate and 10 per cent phenylephrine hydrochloride. The procedure varies depending upon whether or not the cataract is complete and whether or not good pupillary dilatation can be obtained preoperatively by mydriatics.

When the cataract is complete, a wide cruciate incision is made with a Zeigler type knife through the lens capsule and the knife needle is withdrawn. The No. 19 needle attached to a 2 c.c. syringe containing approximately 0.25 c.c. of saline solution is inserted through the knife-needle incision. If the lens does not aspirate readily, fluid is forced into the anterior chamber and aspirated out several times. Even dense central nuclear plaques or membrane can be sucked into the lumen of the needle. If lens material remains, the needle can be reinserted into the chamber by injecting saline to deepen the chamber.

If the cataract is incomplete, preliminary needling is carried out. A large cruciate incision is made in the anterior lens capsule. Aspiration is performed when the lens is completely opaque and softened as a result of the action of the aqueous, usually from 2 or 3 days to a week. At that time the operation as described for complete cataract is performed. If the pupil does not dilate well preoperatively, the aforementioned operations must be combined with complete iridectomy.

—Joshua Zuckerman, M.D.

Intraocular Acrylic Lenses. HAROLD RIDLEY. *Brit. J. Ophth.*, 1960, 44: 705.

RIDLEY, who is the originator of the implantation of the posterior chamber lens, reviews the history of implantation of intraocular lenses, discusses his results with posterior chamber lenses, describes the surgical technique in detail, and reviews the complications encountered in 750 cases. It is admitted that implantation of posterior chamber lenses is often followed by postoperative complications. The various forms of anterior chamber lenses are mentioned and a new type, the tripod lens, is described.

Ridley concludes that intraocular acrylic lenses have found a permanent place in ophthalmic surgery. A one stage cataract extraction with implantation of the anterior chamber lens requires skill and experience of the surgeon but a two or three stage procedure, that is, cataract extraction, lens implantation, and capsulotomy is not a difficult pattern and makes no such demands. *—Ray K. Daily, M.D.*

Results in 39 Bilateral Ridley Intraocular Implants. WARREN S. REESE. *Brit. J. Ophth.*, 1960, 44: 713.

THIS IS principally a tabulated analysis of 39 cases in which the patients had Ridley operations performed on both eyes. The dates of the operations, the corrected visual acuity for distance and near, the complications, and the date of the last examination are given in tables. Reese deplores the fact that little work has been carried out in this field in the United States. *—Ray K. Daily, M.D.*

Intracorneal Lamellar Keratoplasty. TADEUSZ KRWAWICZ. *Brit. J. Ophth.*, 1960, 44: 629.

THE AUTHOR DESCRIBES and illustrates clearly an ingenious method of lamellar keratoplasty. The lamellar graft, instead of being sutured to the cornea from which the scar has been dissected, is inserted into a corneal pocket between the scar and retained portion of the cornea. The graft needs no sutures and is held in good apposition by the superimposed corneal flap. Eight days after this operation the anterior wall of the pocket, which is the corneal scar, is carefully cut away with a trephine, leaving a narrow edge of the host cornea around the graft. After ascertaining experimentally that the procedure can be successful, the author performed it in 6 clinical cases.

Brief clinical histories of these 6 patients are tabulated relative to the diagnosis, type of corneal opacity, preoperative and postoperative visual acuity, clarity of the graft, and accompanying ocular changes. From the results of the clinical experiment the author concludes that the operation is suitable for superficial corneal opacities and for therapeutic purposes such as diseases of the graft.

The merits claimed for this procedure are elimination of the risks of faulty apposition and of displacement of the graft and reduction of operative trauma by elimination of sutures in the graft.

—Ray K. Daily, M.D.

The Treatment of Corneal Dystrophies by Keratoplasty. WILLIAM F. HUGHES. *Am. J. Ophth.*, 1960, 50: 1100.

A SUMMATION of observations emerging from a survey of 115 keratoplasties for corneal dystrophy and 125 for other types of corneal opacification is given. The results in 43 cases of keratoconus are tabulated relative to clarity of graft and visual acuity. This experience led the author to conclude that filling the anterior chamber with saline instead of air is effective in insuring its early restoration after a keratoplasty. The results in 22 cases of Fuch's epithelial dystrophy suggest that in these cases it is more prudent to postpone operation until vision falls below the reading level and epithelial edema develops.

Of 21 patients with hereditary dystrophy 61 per cent had entirely clear grafts and 86 per cent showed an improvement in visual acuity. Lipid degeneration of the cornea is an indication for keratoplasty, corticosteroids and postoperative beta radiation being required to prevent postoperative vascularization. Preoperative radiation has been discontinued because it was found to retard healing. Postoperative radiation is best avoided for the first 3 to 4 weeks.

The results of marginal grafts in Mooren's ulcer are not encouraging. The author advocates cataract extraction and grafting at the same session, having found that the results of separate operations were no better than those obtained by a one stage operation. An analysis to determine the effect of steroids on the healing process shows that they do not delay healing. No correlation was found between the vascularity of the recipient cornea and the incidence of homograft reactions. *—Ray K. Daily, M.D.*

Observations on Reconstructive and Therapeutic Corneal Grafting. ARTHUR GERARD DEVOE. *Am. J. Ophth.*, 1960, 50: 1124.

THIS IS an analysis of the results of keratoplasty in 40 cases in which the procedure was employed not to restore visual acuity but primarily for tectonic and therapeutic purposes. In 6 cases of vascularized and deeply scarred corneas resulting from chemical burns, keratoplasty failed to establish avascularity. In 1 patient who had a loss in stroma, an increase in stromal thickness was obtained. Of 10 cases of descemetocele

in which there was threatened loss of the eyeball, the globe was saved in 7.

In 3 large sterile ulcers lamellar keratoplasty resulted in preserving a 20/90 visual acuity and in checking the destructive process. The results of penetrating keratoplasty in 8 perforating ulcers lead DeVoe to advocate this procedure except for large perforating ulcers due to Pseudomonas aeruginosa for which a large conjunctival flap is preferred.

Of 6 therapeutic grafts in cases of stromal herpetic keratitis 5 were successful. In 4 cases of Mooren's ulcer ring type grafts were unsuccessful in 3. In 1 the graft was successfully retained and visual acuity remained normal. —*Ray K. Daily, M.D.*

EAR, NOSE, AND SINUSES

Surgical Treatment of Nasal Hemorrhage. FRANCIS BERGHMANS QUINN, JR. *Arch. Otolar.*, Chic., 1960, 72: 734.

THE AUTHOR briefly discusses the incidence and causes of nasal hemorrhage and emphasizes the absolute necessity of accurate localization of the source of the bleeding. For this purpose direct suction by a neurosuction tip is necessary. The field must be well illuminated by a headlight.

As regards therapy, the author believes the most desirable methods of arresting nasal bleeding are those which compress or destroy the bleeding vessel with a minimum of injury to the surrounding structures and the least discomfort to the patient. Precise, gentle, but firm packing over the offending vessel, either alone or in combination with electrical or chemical coagulation of the bleeding point, will control the great majority of nosebleeds.

The most troublesome hemorrhages generally arise from the relatively inaccessible regions of the olfactory cleft and the posterior choanae. In these cases, cauterization is often impossible and anterior packing is frequently inadequate to control the bleeding. Here, the expedient of a posterior choanal or nasopharyngeal pack may be required, not once, but repeatedly.

Various authors have suggested use of vitamins C and K in the control of epistaxis. Also, the use of estrogens, plasma expanders, whole blood, and sedation is briefly mentioned.

In cases of unusual gravity, ligation of the bleeding vessel must be considered. The author describes a method of ligation of the external carotid artery and the anterior ethmoid artery. He mentions the technique, described by Hirsch, of ligation of the internal maxillary artery by means of a transantral approach.

There is 1 case report. —*John J. Ballenger, M.D.*

Pituitary Chromophobe Adenomas of the Nasopharynx. STEVEN BORSANYI. *Arch. Otolar.*, Chic., 1960, 72: 779.

THE AUTHOR STATES that among the neoplasms of the pituitary gland, adenomas are the most common and usually arise from the pars distalis. They usually reach the nasopharynx by downward extension. Six possible pathways of extension are quoted which are, in order of frequency, (1) pharyngeal, (2) hypothalamic, (3) temporal, (4) by invasion of the cavernous sinus, (5) posterior subtentorial, and (6) frontal.

The patient usually does not have outstanding symptoms unless this tumor continues to expand into surrounding structures. Nasal obstruction, blood tinged sputum, recurrent epistaxis, and rhinorrhea may occur. General symptoms may include headache, bitemporal hemianopsia, mental changes, olfactory hallucinations, diplopia, and disturbances of different endocrine glands.

On the roentgenogram the ballooned out sella turcica is most characteristic. The ventriculogram is an aid in determining the extent and operability of the adenoma.

The intracranial pressure and protein content of the cerebrospinal fluid may be increased. The metastasis of primary pituitary tumors is debatable though not considered likely. The question of malignancy is another unsettled point.

One case report of pituitary adenoma is presented. —*John J. Ballenger, M.D.*

Fluid Levels Within the Paranasal Sinus Field; Their Nature, Character, Behavior and Significance. M. GLASS. *Med. Proc.*, 1960, 6: 550.

THE AUTHOR EMPHASIZES that the paranasal sinuses rarely conform to the classical textbook descriptions; the sinuses frequently vary in number, in position, and in the presence of intrasinal septa. Communications between adjacent sinuses may also vary. These common normal variations in structure must be taken into account in interpreting roentgenologic evidence of the presence of fluid or of other structures in the sinuses.

It is emphasized that all fluids within the sinuses, where there are air fluid borders, will show a concave upper surface and that serous fluids may sometimes show a fluid air boundary which remains horizontal despite changes in position of the head. In general, the author emphasizes the need for great caution in interpreting the significance of the presence or absence of fluid levels.

This article is profusely illustrated by roentgenograms of pathologic sinuses, but no mention is made of the relationship between the diagnostic signs described and methods of treatment. —*John R. Lindsay, M.D.*

MOUTH AND HYPOPHARYNX

The Indication for External Use of Screws in Surgery of the Jaw (Die Indikation der extraoralen Verschraubung in der Kieferchirurgie). H. HARNISCH and J. GABKA. *Chirurg*, 1960, 31: 433.

THE AUTHORS have benefited from the use of plastic covered metric screws which fit tightly into the bone. The screws were tried out first on dogs by a veterinarian. The plastic covered metric screw is a great improvement over the wooden grooved screws used in America because the latter tend to rust.

Therapeutic indications are as follows: (1) application of splints to edentulous or almost edentulous patients, which, in the authors' opinion, is the most important indication; (2) fractures of the lower jaw with good teeth whose reposition is accomplished without difficulty; (3) fractures at the angle; (4) fractures of the joint in edentulous lower jaws; and (5) spontaneous fractures in edentulous mandibles con-

taining cystic processes, osteomyelitis, or malposed teeth.

Prophylactic indications are: (1) the presence of large cysts or benign tumors; (2) patients with malposed teeth whose removal might fracture the jaw; (3) patients with osteomyelitis, for prevention of spontaneous fractures; (4) operation for prognathism, especially in patients with poor teeth; and (5) temporary splinting of the mandible necessitated by neoplasms in the floor of the mouth.

—*O. Erik Hallberg, M.D.*

Irradiation Necrosis of the Mandible (Osteoradionekrose der Mandibula). W. RÜBE and F. FLÖTE. *Fortsch. Röntgenstrahl.*, 1960, 93: 472.

NECROSIS OF THE BONE of the lower jaw is a frequent complication of irradiation of intraoral carcinomas. The symptoms, diagnosis, prophylaxis, and treatment of necrosis of the lower jaw are discussed on the basis of findings in 192 cases encountered at the Irradiation Institute of the Free University in Berlin, Germany.

The following six factors are of particular significance in the pathogenesis: (1) death of osteocytes from irradiation, (2) ulceration of the mucous membrane, (3) infection, (4) trauma from chewing, (5) extraction of teeth, and (6) lack of saliva.

The major concern in the treatment of somatic irradiation damage is maintenance of function of the lower jaw. With the aid of antibiotics, modern anesthesia, blood transfusion, and so forth, sequestrectomy may be regarded as safe. Responsibility for bone necrosis rests with the roentgenotherapist in the same way as responsibility for accidents during operations rests with the surgeon. Bone necrosis, apart from actual errors in judgment, is a calculated risk.

—*O. Erik Hallberg, M.D.*

The Pierre-Robin Syndrome, a Surgical Emergency in the Neonatal Period. R. T. ROUTLEDGE. *Brit. J. Plast. Surg.*, 1960, 13: 204.

IN THE PAST 5 YEARS, 18 patients with the Pierre-Robin syndrome have been treated in the Frenchay Hospital in Bristol, England. This seemingly large incidence is undoubtedly due to the increased frequency of diagnosis of this syndrome which consists of a congenitally small recessive mandible, usually associated with a cleft of the soft palate, and manifesting itself by respiratory embarrassment and difficulty in feeding.

In most of the publications on this condition glossoptosis is said to cause the respiratory distress as a result of the tongue falling back in the nasopharynx. This description, however, does not give a true picture of the role of the tongue in the production of the respiratory crisis. The trigger of many of these episodes of respiratory obstruction seems to be the impaction of the tip of the tongue in the soft palate. The tongue cannot be disengaged, and the violent muscular contraction resulting from the effort to free the organ bulges the tongue out of the oral cavity so that it acts as a cork in the neck of the nasopharynx. The symptoms of suffocation result until the degree of anoxia is reached at which the tongue becomes limp and drops out of the nasopharynx, restoring the airway. This is not the only mechanism, however. An abnormally enlarged tongue may also be at fault. This possibility was illustrated by the case of 1 child who had no symptoms until she was 7 weeks of age, at which time the bouts of obstruction started, presumably because of the increase of the size of the tongue. It is recommended that the patient be nursed and kept in a prone or semiprone position in order to take advantage of the slight gravity effect on the tongue to increase the airway.

The operation is best performed under general anesthesia. The author does not favor the Douglas operation but prefers a modification. Although the principle is similar, an incision is carried around the edge of the anterior part of the tongue, dividing the end of the tongue transversely. A matching incision is placed in the lower buccal sulcus, separating it down to the muscle. The lower lip of the tongue incision is united with the posterior mucosal flap. A deep muscle suture is taken and tied after the retention suture is placed. The retention suture is similar to that of Douglas and starts far back on the tongue and passes through the skin over the chin. This tension suture is removed 2 weeks later.

Of the 18 patients admitted for treatment, 14 had an anterior fixation of the tongue performed and 5 died. One other patient was moribund on admission and died within an hour. Of the 6 children who died, 4 had multiple congenital abnormalities of a severity to jeopardize survival, whereas in the remaining 2, who made good progress after operation, bronchopneumonia developed after a breakdown of the airway repair. Four repairs had to be remade on about the seventh day after operation. One complication which has not been publicized is the fact that after this anterior fixation a condition exists which the author named the "tongue hump." With the anterior fixation the middle portion of the tongue projects upward into the arch of the palate, and, together with the broad fixation, the alveolar ridge interferes with oral respiration. This presents a problem unless nasal breathing is good. The author hopes to overcome this by inserting a nasopharangeal tube to facilitate nasal breathing. Tracheotomy is not performed. The tongue is released at 6 months and the palate is repaired at 12 months.

—*Carl Schiller, M.D.*

Experiences with the Pharyngeal Flap in Cleft Palate Surgery. HERBERT CONWAY and DICRAN GOULIAN. *Plastic & Reconstr. Surg.*, 1960, 26: 590.

APPROXIMATELY 25 per cent of the patients who have a successful closure of a congenital cleft of the palate will continue to have unacceptable speech. Two basic problems are usually found in these patients: (1) an excessive velopharyngeal space, preventing the patient from closing off the nasal from the oral pharynx, and (2) the absence of adequate soft palate musculature to effect such closure.

At the New York Hospital, New York, New York during the last 12 years, these patients have been treated with the aid of a pharyngeal flap, used with or without a palatal pushback. The pharyngeal flap acts to hold the retroplaced palate in position and prevents it from being displaced by contraction from the scar tissue on the nasal surface of the palate, which inevitably forms during healing. At the same time, it helps to occlude the velopharyngeal aperture, acts as a

sounding board, and provides an additional muscular aid in the activation of the soft palate. The superiorly based flap has been employed but was found to possess no practical advantage over the technically more satisfactory, inferiorly based flap and is, therefore, no longer used.

One-hundred and sixty-two patients have been treated with the pharyngeal procedure, used with or without a palatal pushback. The average age of the patient at the time of operation for the flap procedure was 11.1 years. After rehabilitation, 87.7 per cent developed acceptable speech. The incidence of complications was slightly under 5 per cent. These consisted mostly in separation of the flap from the palate in 3 cases and the pharyngeal flap being too wide in 2 cases.

The authors conclude that the palatal pushback operation in combination with an inferiorly based pharyngeal flap as a single stage procedure was found to be a highly effective way to deal with the problem of defective speech in which the primary defect consists of velopharyngeal incompetence secondary to inadequate soft palate substance, length, or mobility. This procedure is looked upon as a technique for reclamation of patients in whom primary suture has failed, and it is not the policy to use the procedure in infants. —*Carl Schiller, M.D.*

Long Nose with Double Lip Syndrome. SAMUEL FOMON, JULIUS W. BELL, JOSEPH LUBART, VICTOR SYRACUSE, and ALFRED SCHATTNER. *Arch. Otolar.*, Chic., 1960, 72: 614.

THE AUTHORS state that a double lip associated with a long nose is not an uncommon deformity. The two conditions must be attended to simultaneously if the result is to be acceptable. Correction of either deformity alone serves only to exaggerate both disfigurements. The following types of double lips exist: (1) hypertrophy of the mucous membrane, (2) total hypertrophy of the lip, (3) malfunction of the levator muscles of the lip, (4) short lip, (5) short frenum, and (6) cicatricial contractions simulating double lip. The different types are discussed in some detail and their management is outlined.

The historical and anatomic aspects and the probable cause of the double lip are thoroughly discussed. —*Henry S. Patton, M.D.*

Malignant Tumors of the Palatine Tonsil (I tumori maligni della tonsilla palatina). G. B. LEONARDELLI, M. MAGRI, AND F. PIZZETTI. *Tumori*, Milano, 1960, 46: 366.

A STUDY of 376 malignant tumors of the tonsils, representing 12 per cent of oral neoplasms, revealed that 77 per cent occurred in males, most frequently in the sixth and seventh decades. Subjective symptoms included pain on swallowing, dysphagia, ear ache, and a sensation of burning or of a foreign body. Eighty per cent of the patients were examined within 3 months of onset of symptoms. The tumor was detected in this period in only 65 per cent. The diagnosis was made in the ulcerative stage in 36.9 per cent, in the vegetative stage in 37.8 per cent, in the infiltrating stage in 71 per cent, and with cervical adenopathy in 81 per cent. The chief conditions to be excluded were syphilis, tuberculosis, and actinomycosis. Histologic examination of 297 cases revealed 193 carcinomas, 68.4 per cent of which were spinocellular forms, and 104 sarcomas, 93 per cent of which were reticulosarcomas. The highest incidence of carcinoma and sarcoma was in males, 88 and 55 per cent, respectively, and the neoplasms occurred most frequently in the seventh and sixth decades.

The standard Patterson technique of roentgenotherapy was applied to carcinoma of the infiltrative type with a slight tendency to invasion of adjacent tissues. Roentgenotherapy was also applied to carcinoma that had already invaded adjacent tissues. Recently telecobalt therapy has been used. If involved lymph glands could not be removed surgically, roentgenotherapy was applied. After irradiation a biopsy specimen of the remaining tissue may yield indications for repeated treatment to eradicate residual foci.

Of the 104 sarcomas the majority were reticulosarcomas with a very small percentage of lymphosarcomas. Whereas previously these neoplasms were treated by operation and roentgenotherapy, now roentgenotherapy alone is applied to the primary lesion and adenopathy, permitting application of a tumor dose with little reaction of adjacent tissues. Medical palliative treatment is considered only in cases of recurrence and in cases with extension to other lymphoglandular areas.

The patients with carcinoma showed a 5 year survival of 28.6 per cent, those with sarcoma a survival of 30 per cent. Recurrences develop early, usually within 6 months after termination of treatment. —*Edith Schanche Moore*

Carcinoma of the Larynx: Comparative Experience in the Management of 951 Limited Lesions. BRIAN F. MCCABE and JOHN E. MAGIELSKI. *Ann. Otol. Rhinol.*, 1960, 69: 1013.

THE AUTHORS EMPHASIZE the fact that a small, localized, squamous cell carcinoma on the edge of a vocal cord is more amenable to cure than is any other cancer except a basal cell carcinoma of the skin. The major reasons for this are the ease of visualization and the paucity of lymphatics in the vicinity of the true vocal cords. Both surgery and irradiation offer excellent results in the treatment of small glottic carcinomas, but the latter is the preferred form of therapy if it is to be administered by a competent roentgenotherapist who observes the larynx daily during treatment.

In a small but significant number of patients with limited lesions a lasting cure may be obtained by laryngoscopic techniques only and local removal of the lesion. Patients treated in this way must be followed up closely and regularly and their progress assessed by regular laryngoscopic examination. It is emphasized that radiation is not a conservative form of treatment and is associated with numerous risks; the radiation often results in severe epidermitis and mucositis which may often be considerably prolonged. If during roentgenotherapy it becomes evident that the tumor is not being controlled, operation is immediately indicated.

The authors emphatically believe that the number of total laryngectomy failures will decrease only with

proportionate increase in education of patient and physician. Five year cure rates of total laryngectomies have remained almost static over the past 20 years despite the introduction of such technical improvements as wide-field over narrow-field laryngectomy.

—*John R. Lindsay, M.D.*

SALIVARY GLANDS

Tumors of the Salivary Glands (Contributo allo studio dei tumori delle ghiandole salivari). A. CAROTENUTO and M. GRIFI. *Rass. internaz. clin. terap.*, 1960, 40: 969.

IN THE PERIOD 1950 to 1959, 24 patients with neoplasms of the salivary glands were observed and treated at the surgical clinic of the University of Naples Medical School, Naples, Italy. The tumors involved the parotid gland in 18 patients, or 75 per cent, and the submaxillary gland in the remaining 6, or 25 per cent. In 3 cases the tumor was histologically benign, in 3 other cases it was malignant, and in the remaining 18 cases the tumor was of the so-called fixed type. There was no relationship between histologic type of the tumor and its location; each of the three different types described above occurred indifferently in either gland.

All patients were treated surgically, but no mention is made of the type of intervention used in the different types of tumor. In no case was postoperative roentgen treatment used.

Eighteen patients or 75 per cent of the total series were alive and well at the time of publication of the report. These include 1 patient with malignant tumor, 2 with benign lesions, and 15 with mixed forms. Of the remaining 6 patients, 3 or 12.5 per cent died after operation, and 3 failed to report for follow-up examination. The 3 deaths were in 1 patient whose tumor was originally malignant, and in 2 with malignant transformation of mixed forms.

—*Riccardo Benvenuto, M.D.*

Rare Tumors of the Parotid Region: Synsialomas (Seltene Geschwuelste der Parotisregion: Synsialome). A. GLÄSER. *Zbl. Chir.*, 1960, 85: 1989.

SYNSIALOMAS are the tumors of the parotid region which originate from the fibrous tissue, the blood, the lymphatic vessels, and the nervous tissue, not from the glandular tissue. Tumors of the latter are called sialomas.

The author has reviewed 575 cases at the University Hospital in Leipzig, Germany. Of these, only 18 were synsialomas. Hemangiomas were most common, 6 of 18 cases. They are predominantly found in children and are often associated with hemangiomas of the skin. They also occur in Sturge-Weber disease. Despite rapid growth, these tumors must be considered benign, and recurrence after incomplete removal is frequent. Surgical removal is nevertheless the treatment of choice. There were 2 cases of the very rare glomus tumor which must be differentiated from carotid body tumors. There were 3 cases of lymphangioma, which is most common in infants. Lymphangioma colli cysticum has to be ruled out. In the 3 cases of lipoma the lesion showed no preference for any age group. These tumors can be extra-aponeurotic, intra-aponeurotic, or intraglandular.

In differential diagnosis lipomatous pseudohypertrophy must be kept in mind. There were 4 cases of neurinoma. They usually originate from the facial nerve. They are benign tumors, rarely occurring in young children. The facial nerve should never be sacrificed when such a tumor is found since recurrence is rare, even after incomplete removal. The differential diagnosis of the synsialoma is very important since other tumors of the region have a poorer prognosis.

There are several photomicrographs and illustrated case reports included in the presentation.

—*Eckhard Fischer, M.D.*

Treatment of Parotid Tumors. T. G. BLOCKER, JR. *Am. J. Surg.*, 1960, 100: 805.

OF 54 OPERATIONS upon the parotid gland performed during the past 5 years at the University of Texas Medical Branch Hospitals, Galveston, Texas, 39 were for parotid neoplasms. Twenty-eight of the tumors were benign and 11 were classified as malignant. The author stressed conservatism, with identification and protection of the facial nerve in all cases except those of very small lesions on the external surface of the gland or the so-called "hidden" parotid tumor which presents at the angle of the jaw but extends medially into the pterygoid space.

Even if the tumors are malignant the author attempts to preserve the nerve by dissection of the tumor and the use of interstitial irradiation by the rolled flap technique. Low intensity radium needles are used at the time of operation, and upon their removal in 4 to 10 days the skin flap is unrolled and resutured in place. Radical neck dissection is reserved for clinical evidence of cervical node metastasis.

—*Harvey W. Baker, M.D.*

Primary Malignant Melanomas of the Parotid Gland. GEORGE W. GREENE, JR., and JOSEPH L. BERNIER. *Oral Surg.*, 1961, 14: 108.

THE MELANOBLAST is a normal constituent of oral epithelium and the parotid gland is derived from embryonic oral epithelium. It is therefore reasonable to assume that melanoblasts could be demonstrated in the normal human parotid. In the authors' study normal human parotid gland was positive for melanin, and dopa stains carried out on the normal parotid tissue of dogs gave positive reactions, suggesting that such dopa-positive cells are also present in normal human parotid tissue.

The authors conclude that melanomas of the parotid gland may therefore arise directly from malanoblasts in this tissue. The cases of 5 patients diagnosed as having malignant melanoma of the parotid were reviewed in order to determine whether the lesions were primary at this site. The following criteria were used in this connection: (1) the presence of dopa-positive cells in normal parotid gland tissue; (2) demonstration of malignant melanomas in the parotid gland, and (3) inability to demonstrate any other primary site. The presence of dopa-positive cells could not be proved in the 5 cases since the material on all of them was formalin fixed. In all 5 cases, however, the presence of melanin-containing cells was demonstrated by the ferrous ion uptake stain of Lillie, a specific reaction for melanin.

Case histories of the 5 patients are given and microscopic sections are included, indicating the presence of malignant melanoma in each of them. In none of the 5 cases was there any history or evidence of any other primary site. The authors conclude that these 5 cases, together with those previously reported in the literature, should establish malignant melanoma of the parotid gland as a primary lesion. The significance of this conclusion is that a primary lesion is amenable to appropriate therapeutic measures whereas a metastatic lesion is not. —*John R. Lindsay, M.D.*

NECK

Indications for Tracheostomy. HERBERT T. RANSDELL, JR., and BRYAN T. IGLEHART. *South. M. J.*, 1961, 54: 1.

TRACHEOSTOMY was first used in the year 124 B.C. Surprisingly, the indications originally proposed for tracheostomy, obstruction of the upper airway, remained relatively unchanged until the past few years. Further benefits of tracheostomy have recently been set forth, however, and the indications for its use have been broadened.

In patients who are unable to cough effectively and who are thereby retaining their tracheobronchial secretions, tracheostomy may often be lifesaving. All measures should first be taken to promote the normal voluntary cough mechanism, but when this proves inadequate, tracheostomy is advised.

The indications for 140 tracheostomies performed in the year 1958 were reviewed. Retained secretions actual or anticipated, usually in severe head injuries, were the most common indication for tracheostomy in adults. Severe chest trauma with multiple rib fractures and severe flail or paradoxical motion of the chest wall was another frequent indication for this procedure. —*Frank J. Milloy, M.D.*

Subacute Granulomatous Thyroiditis, a Clinicopathologic Review. ARTHUR A. STEIN, I. HERNANDEZ, and JOHN C. MCCLINTOCK. *Ann. Surg.*, 1961, 153: 149.

RECENT DIFFERENCES in opinion regarding diagnosis, therapy, and cause of granulomatous thyroiditis have stimulated this review of 36 cases in which the pathologic alterations are documented sequentially in order to determine the role of disruption of the follicle in the pathogenesis.

Gross pathologic changes include multiple adhesions to the trachea or overlying strap muscles, bilateral patchy involvement, with firm tan or grey white parenchyma early, and later diffuse large irregular areas of scarring. This disease has been found in conjunction with all other forms of goiter except Hashimoto's disease.

In the group studied, the average age was 43 years, 97 per cent being women. Presenting symptoms in order of frequency were swelling or pain in the neck or throat, dyspnea, dysphagia, cough, and choking sensation. Onset of symptoms was sudden in 64 per cent. An increase in I^{131} uptake and decreased serum protein bound iodine level is peculiar to this disease. Seven of the 36 patients were refractory to steroid therapy. All of the 36 underwent surgical treatment, 83 per cent having subtotal thyroidectomy. Preoperative therapy in order of decreasing frequency included Lugol's solution, cortisone, penicillin, thyroid extract, and thiouracil. In a follow-up averaging nearly 6 years 82 per cent complained of hypothyroidism.

Microscopically, the only absolute criterion for admission to the study was the presence of the typical pseudotuberculous granulomas. Histologic findings can be divided into 3 stages. In the early stage the follicle is distended and the lining epithelium shows marked hypertrophy and hyperplasia with formation of multinucleated giant epithelial cells. The midstage is characterized by disruption of the basement membrane of the acini and neutrophilic infiltration of the colloid with later replacement by lymphocytes. The late stage reveals an increase in the amount of collagen and disappearance of the multinucleated giant cells. Regional blood vessels show obliterative endarteritis.

Although autoantibodies have been previously suggested as a basic pathogenesis for this disease, the authors believe that unknown initiating factors antedate the disruption of the follicle, which suggests that the autoimmune mechanism is a secondary phenomenon and a complication rather than the primary pathogenesis. —*Patrick F. Jewell, M.D.*

Complications of Thyroidectomies (Complications des thyroïdectomies). B.-Y. YOVANOVITCH. *Presse méd.*, 1960, 68: 2227.

THIS IS A REPORT on the complications encountered as a result of 1,500 thyroidectomies. The surgical indications were found in 1,100 cases of nontoxic goiters, 278 of toxic goiters, 11 of thyroditis, 63 cases of cancers, 2 of tuberculosis, and 46 of unclassified pathologic conditions. Postoperative tetany occurred in 10 cases. Nine were cured spontaneously after medical management. In the tenth case, after 10 months of medical management, a parathyroid transplant from a newborn was successfully carried out. The patient was well after a 5 year follow-up. There were 30 instances of injury to the recurrent nerve. Recovery in 17 of these occurred within 25 days. In the remaining 13 patients paralysis was permanent, even though 6 of them did show minimal recovery from what were probably crushing injuries. In 2 cases resuture of the nerve was attempted, but no recovery of laryngeal function resulted.

Four cases of thyroid crisis were seen among the toxic goiters resulting in 2 deaths. Myxedema occurred in 32 patients. In 11 of these the myxedema was considered severe. Severe suffocating hemorrhages were encountered in 4 cases, all occurring within 24 hours. Of interest is the fact that in 2 cases the culprit was the middle thyroid vein. Uncosmetic scars such as keloids, adherent scars, and infected sutures were present in 102 cases. About two-thirds of these were corrected by reoperation.

Among the general systemic complications were 10 cases of bronchopneumonia with 2 deaths and 4 fatal cardiovascular accidents. The latter 4 patients had thyrotoxic cardiac disease. The total mortality was 8 cases or 0.53 per cent. If the 18 patients with thyrotoxic heart disease are excluded the mortality rate falls to 0.26 per cent. The author concludes that thyroidectomy is still a safe procedure if performed

carefully. He has had no complications in his last 500 cases. —*Joseph J. Bahuth, M.D.*

Hypernephroma with Thyroid Metastases (Hypernephrommetastasen in der Schilddruese). G. LANGE. *Münch. med. Wschr.*, 1960, 102: 2152.

BONE, LIVER, AND LUNG are the most common sites of metastatic hypernephromas. Metastases into other organs are less common.

The author's report concerns a patient admitted with a rapidly enlarging goiter. Upon removal of the thyroid the microscopic examination revealed a nodular goiter with metastases from an essentially silent right hypernephroma. Seven months later a right nephrectomy was performed. The delay was caused by the patient. Three years after the last operation there was no evidence of other metastases on repeated skeletal surveys and chest roentgenograms.

—*Karel B. Absolon, M.D.*

Biochemical Diagnosis of Primary Hyperparathyroidism (Diagnostic biochimique des hyperparathyroidies primitives). A. LICHTWITZ, S. DE SÈZE, D. HIOCO, PH. BORDIER, and R. PARLIER. *Sem. hôp. Paris*, 1960, 36: 3022.

THE MAJOR biochemical signs of hyperparathyroidism are hypercalcemia, hypercalciuria, hypophosphatemia, and hyperphosphaturia. This symptom complex can be found in other conditions and could be absent from the most authentic cases of hyperparathyroidism. It is, therefore, extremely important to establish the diagnosis before involving the patient in the "adventure" of a parathyroidectomy. This report, from the Lariboisiere Hospital in Paris, presents the biochemical signs of hyperparathyroidism with emphasis upon some that are almost not utilized or have not been given the importance they deserve. The study is based on 11 patients; 3 had the classical signs of hyperparathyroidism and the remaining 8 had the clinical and roentgenologic signs of a definite osteoarticular lesion.

The authors divide the biochemical picture into static and dynamic phosphocalcic syndromes. The former is made up of a mineral and organic syndrome. The latter consists of a series of tests whereby the calcium and phosphorus behavior is studied under a variety of test substances. In addition, the authors study the kidney involvement and the calcium balance utilizing radioactive calcium, Ca^{45}.

In the mineral syndrome a blood calcium level above 110 mgm. is a very important sign but it is found more often in multiple myeloma than in hyperparathyroidism. Moreover, hypercalcemia is found in some carcinomas with bone metastasis, in hypervitaminosis D, in sarcoidosis, and rarely in the milk alkali syndrome. The peculiar aspect of the hyperparathyroid hypercalcemia is the lowering of the ratio of ionized calcium to total calcium. Normally, this ratio is about 57 per cent, in hyperparathyroidism it falls to about 50 per cent; in multiple myeloma it is normal or above 57 per cent. The hyperparathyroid hypercalciuria is always associated with hypercalcemia, although there is often no constant relationship between the two values. Provided there is no evidence of kidney disease, this dissociation is important. It clearly shows an often forgotten property of the parathyroid hormone, that is, the property of increasing the tubular reabsorption of calcium. The renal clearance of calcium is normal, whereas it is increased in osteoporosis, in other osteolyses, and in idiopathic hypercalciurias. The coefficient of absorption of the calcium increases in hyperparathyroidism. The depression of blood phosphorous level is very characteristic but not constant. On the contrary, the phosphaturia is definitely increased. The study of the tubular reabsorption of phosphorus shows that its clearance is increased. Likewise, the ratio of urinary phosphorus to blood phosphorus is increased. The coefficient of reabsorption of phosphorus (TRP) is lowered to 80 per cent and below and the maximum tubular excretory capacity is also decreased. There is finally a diminution of the blood magnesium which decreases further after parathyroidectomy. Crises of tetany unresponsive to intravenous administration of calcium have been successfully treated with magnesium.

In the organic syndrome the alkaline phosphatase is 2 to 4 times the normal. This finding in a decalcified patient is strongly in favor of hyperparathyroidism when there is no roentgenographic evidence of Paget's or osteolytic cancer. There is a frank increase of the blood citrate level, further augmented for a few days after operation. On the contrary, the citrate level is habitually low in multiple myeloma. The electrophoretic pattern shows an increase of the $alpha_2$ and beta globulins. The simple puncture biopsy of the iliac crest reveals signs that are strongly in favor of the diagnosis of Recklinghausen's disease in a hypercalcemic subject: large areas of osteoid reaction with osteoblastic changes, sometimes associated with discrete osteolytic changes, as irregularity of the architecture, osteoclasia, and fibrosis of the marrow. Patients with osteomalacia and Paget's disease show the same changes, but they are not hypercalcemic, and the patients with myeloma or metastatic bone involvement might be hypercalcemic but only exceptionally show osteoid changes.

In the dynamic syndrome the test utilizing sodium phytate gives a measure of the osteolysis but it is unable to determine the cause. The test utilizing vitamin D_2 evaluates the osteoid reaction and consists of a standard and a prolonged test. The latter permits the differentiation of the adenomatous from the secondary hyperparathyroidism. The calcium level increases in the former whereas the level of phosphorus increases in the latter. The blood phosphorus level and the phosphaturia remain unchanged after infusion of 1,000 mgm. of calcium—the Howard test—and this is a good sign of primary hyperparathyroidism. The prednisone test leaves the hyperparathyroid calciuria unchanged, whereas it decreases the calciuria of Paget's disease and increases that of osteoporosis.

Calcium balance study and exploration with radioactive calcium, infrequently used, confirm the increased intestinal absorption of the alimentary calcium as well as the skeletal calcopexic aptitude of the hyperparathyroid patient. These two factors tend to mend the ravages due to the parathyroid hyperosteolysis. The study of the hyperparathyroid kidney reveals an almost constant reduction of the urea clearance as well as an inability to concentrate the

urine, with a resulting polyuria, hyposthenuria, isosthenuria, and diminution of the tubular reabsorption of free water.

In view of the uncertainty resulting from extemporaneous histologic examinations of parathyroid tissue and of the relative frequency of multiple adenomas, the authors believe that the verdict of the laboratory is tantamount to the final word for a successful parathyroidectomy. The most significant finding is not the fall of blood calcium but the dramatic decrease of the urinary phosphorous which can be detected only a few hours after operation and is the best evidence of a successful intervention.

There is a detailed analysis of the postoperative changes of the blood calcium, the ratio of ionized to total calcium, and calciuria. The authors believe, furthermore, that the laboratory can be of help in preventing and successfully treating postoperative accidents. —*Michele A. Chiechi, M.D.*

Primary Hyperparathyroidism and Urolithiasis (Primaerer Hyperparathyreoidismus und Urolithiasis). DIETRICH BORM. *Deut. med. Wschr.*, 1960, 85: 1880.

THE CAUSE of kidney stones is obscure, but investigators in this field are increasingly aware of the role of the parathyroid glands. There are two types of hyperparathyroidism, primary and secondary. In the primary type there is increased parathyroid epithelial cell function with abnormally high amounts of parathormone excreted. So-called secondary hyperparathyroidism also causes increased parathormone production, but as a compensatory mechanism in conditions with renal functional impairment. The distinction is important, because surgical removal of the parathyroids is successful in the primary type but contraindicated in the secondary. The distinction may be difficult because primary hyperparathyroidism as it progresses damages the kidneys.

Of 112 cases of primary hyperparathyroidism, Black found 29 caused by solitary adenoma, 10 by multiple adenomas, 9 by diffuse hyperplasia, and 1 by carcinoma.

As to how often there is an underlying hyperparathyroidism in patients with urolithiasis, most studies show 3 to 5 per cent; the author found 3 per cent at the Kiel University Surgical Clinic, Kiel, Germany. As diagnostic tests improve, these percentages should increase. Parathyroid function should be studied in all patients with kidney stones.

The classical laboratory findings are hypophosphatemia, hypercalcemia, hyperphosphaturia, and hypercalciuria. However, each laboratory should ascertain its own "normal" range for these examinations, and if possible have the same technician perform them always. The author found the normal serum calcium value at Kiel to be 8.7 to 10.5 mgm. per cent instead of the usually stated 9 to 11 mgm. per cent. Also one must keep in mind that if the serum proteins are depressed, the ionizable calcium level will also go down, and this is the fraction measured. A "normal" serum calcium level in the presence of hypoproteinemia may actually represent hypercalcemia.

The author's normals for serum phosphorus were 2.8 to 4.5 mgm. per cent. Any values repeatedly under 2.8 mgm. per cent associated with the slightest hypercalcemia he considers very suspect. The phosphorus levels are variable, and normal levels do not rule out hyperparathyroidism.

The Sulkowitch test for urine calcium is an easily performed screening test. Calciuria increased beyond the normal produces cloudiness or an actual precipitate when the Sulkowitch reagent—oxalic acid, ammonium oxalate, and glacial acetic acid—is added to urine. If a patient shows a positive Sulkowitch reaction, a quantitative 24 hour urine calcium test must be made, with the patient abstaining for a few days beforehand from calcium-containing foods such as milk and cheese. Values over 200 mgm. are diagnostic of primary hyperparathyroidism.

Hellström believes that the kidneys diminish in concentrating power early in hyperparathyroidism. He states that a urine specific gravity over 1.020 rules out primary hyperfunction. The author agrees with this in general but found a few exceptions. Another valuable test recently developed, and possibly the earliest test to become positive in the course of the disease, is the tubular resorption of phosphorus. Increased parathormone acts on the tubules to diminish their phosphorus resorbing power. The test is made by collecting a 12 hour overnight urine specimen and determining phosphorus and creatinine in blood and urine. Using the formula $TRP = 1 - \frac{UP \times SC}{UC \times SP}$ in which TRP is tubular resorption of phosphorus; UP is urine phosphorus; SC is serum creatinine; UC is urine creatinine; and SP is serum phosphorus. This value normally should come out between 86 and 94 per cent. It is lower in primary hyperparathyroidism.

After successful removal of a parathyroid adenoma, the phosphorus resorption will quickly climb to 100 per cent, then gradually return to the normal levels of 86 to 94 per cent. This reaction is not present if an adenoma has been overlooked at operation or if the rare diffuse hyperplasia was present and only one gland was removed. A second exploration of the neck is indicated in such cases.

—*William B. Gallagher, M.D.*

Vagal-Body Tumor. PATRICIO E. PEREZ, EDGAR G. HARRISON, JR., and WILLIAM H. REMINE. *N. England J. M.*, 1960, 263: 1116.

CHEMODECTOMAS, nonchromaffin paragangliomas, of the neck may arise from the carotid body, the glomus jugulare complex, or from the vagus nerve near or in the ganglion nodosum. Two cases of surgically treated vagal body tumors are reported, making a total of 20 cases in the literature.

The most frequent finding, present in 18 of the 20 patients, was a mass located behind the angle of the mandible in the upper cervical region. In 11 patients the mass displaced the peritonsillar structures medially. Carotid arteriography may distinguish a vagal body tumor from a carotid body tumor and other cervical masses. At operation the tumor is usually found to have replaced the ganglion nodosum and to lie just beneath the jugular foramen at the base of the skull. Complete resection has been successful in 15 patients.

Early operation in the case of these tumors may prevent intracranial extension through the jugular

foramen and subsequent compression of the brain stem. —*Harvey W. Baker, M.D.*

***Nil nocere!* Carcinoma of the Hypopharynx and Larynx as a Late Result After Roentgenotherapy of Benign Skin Diseases, Especially Lymph Node Disease in the Neck Region** (*Nil nocere!* Hypopharynx- und Larynx-Karzinome als Spaetfolge nach Roentgenbestrahlung gutartiger Haut- bzw. Lymphknotenerkrankungen im Halsgebiet). P. KRAHL. *Münch. med. Wschr.*, 1960, 102: 1911.

THE AUTHOR has reported on the relation of irradiation to carcinomas in the region of the hypopharynx and larynx. Diagnosis depends on localization of the tumor in tissue damaged by radiation and on proof of a latent period of one to several decades between radiation treatment and the development of the tumor. The tumors are usually squamous cell carcinomas. Their origin is probably based on a somatic mutation in which internal and external stimuli possibly play an additional part—syncarcinogenesis.

Reports are given of 2 women in whom carcinoma of the hypopharynx developed 40 years after irradiation of the cervical lymph nodes, of 1 man in whom carcinoma of the epiglottis developed 40 years after irradiation treatment for tinea barbae, and of 1 man in whom a papilloma of the larynx and leukoplakia developed 40 years after treatment for tuberculosis of the cervical lymph nodes.

Considering the reports in the literature and the author's own observations, higher irradiation doses, particularly in adolescents, should be employed only for the treatment of malignant tumors. Small anti-inflammatory doses of roentgenotherapy probably are not harmful, according to the author.

—*O. Erik Hallberg, M.D.*

SURGERY OF THE NERVOUS SYSTEM

CEREBRUM, CEREBELLUM, AND HYPOTHALAMUS

Traumatic Epilepsy After Closed Head Injuries. W. Bryan Jennett and Walpole Lewin. *J. Neur. Neurosurg. Psychiat.*, Lond., 1960, 23: 295.

In a concise, well written article packed with important statistics, the authors report their study of traumatic epilepsy in an unselected series of head injuries. One thousand patients, 821 of whom came directly from the scene of the accident, were admitted to the Radcliffe Infirmary, Oxford, England from November 1948 to February 1952. All patients with a cerebral concussion were admitted, the criterion for this being a period of amnesia even if brief.

The patients with seizures were classified in 2 groups. The first called "early epilepsy" included patients who had their first seizure within 1 week of the injury. The second group designated "late epilepsy" included those patients who had their first seizure 3 months or later after the injury. There was only 1 patient who had his first seizure between the seventh day and the eleventh week, and this occurred postoperatively, following the removal of a subdural hematoma 2 weeks after injury. Fourteen patients with previous seizures, some of whom suffered the head injury during the seizure, were excluded from this series.

Forty-six persons had their first seizure within 1 week of the accident. The incidence in the 821 direct admissions was 3.9 per cent, whereas in the 179 referred from other hospitals, most of whom had more severe injuries, the incidence was 8.4 per cent. Only 2 patients had a family history of epilepsy. Eight of the patients with seizures died. All were in coma from the time of injury except 1 with a lucid interval who had an extradural hematoma. Six of these 8 had an intracranial hematoma.

In the series with seizures in the first week there were almost twice as many patients in the age group under 5 years as there were in any other age category. The reasons for this are discussed. Posttraumatic amnesia is a useful guide to the degree of injury, and the incidence of seizures is much greater in those who had amnesia for more than 24 hours. No patient over the age of 25 had epilepsy without amnesia even though there was a fracture. If abnormal neurologic signs were present, the incidence was greater. Epilepsy was 3.5 times more common in cases with a fracture except when the fracture was in the occipital bone in which case the incidence was very small. The cerebral spinal fluid was examined in 174 patients and was found to contain blood in 124 of these. The incidence of early seizures in this group was 9.7 per cent. Of the patients with an intracranial hematoma, seizures in the first week were present in 22.9 per cent.

A selected follow-up study 4 years after injury was carried out. All of those with early epilepsy were traced and 28.5 per cent had late seizures. In 56 cases with depressed fracture, 15 per cent had seizures. One hundred patients with uncomplicated injuries with a posttraumatic amnesia of less than 1 hour had a 1 per cent incidence and in 137 cases of more severe head injuries, such as posttraumatic amnesia greater than 24 hours or intracranial hematoma, 10.4 per cent had epilepsy. At the end of the first year 50 per cent of those with late epilepsy had had their first seizure. This figure reached 70 per cent at the end of the second year and some cases did not develop until 7 years after injury. No late epilepsy in an adult, over 14, with less than 24 hours of posttraumatic amnesia was found unless there was a depressed fracture or intracranial hematoma.

The authors believe that those patients who fall into the categories in which the predisposition to seizures is greatest should take anticonvulsants for 2 years after the injury. —*Robert G. Ojemann, M.D.*

Carotid-Cavernous Fistulas; Etiopathogenic and Therapeutic Considerations (Les fistules carotido-caverneuses; réflexions étiopathogéniques et thérapeutiques). G. Lazorthes, J. Espagno, H. Anduze-Acher, F. Amaral-Gomes, and O. Zadeh. *Ann. chir*, Par., 1960, 14: 1357.

The intracranial, extradural carotid-cavernous fistulas are the most frequent arteriovenous communications. The unusual anatomic relationship between these two structures makes it necessary for only a small rent in the arterial wall to occur. The cause is traumatic in 75 per cent of cases; it may cause a direct tear in the arterial wall, but when this is not evident, trauma may precipitate the rupture of a previous arterial malformation into the cavernous sinus. As a result of the communication, there is passage of arterial blood into the avalvular venous system; second, there is a modification of arterial supply to the corresponding hemisphere. Clinically, there is an exophthalmos, which is usually pulsatile, venous congestion of the conjunctiva and lids, and an intracranial bruit.

In the authors' experience, spontaneous closure of the fistula is an unusual occurrence and operation is necessary. The patient is studied neurologically; bilateral carotid angiography with cross compression studies is essential to determine not only the flow through the anterior communicating artery but also the contribution to the fistula from the opposite internal carotid artery. Preoperative carotid compression in the neck, Matas' test, is emphasized, and the authors perform this study under electroencephalographic control.

Ligation of the internal carotid artery in the neck provides a cure for this lesion in one-third of cases, either immediately or within 1 month. When this procedure does not provide relief, the authors suggest intracranial ligature of the internal carotid artery at its emergence from the cavernous sinus. Carotid ligation is performed under local anesthesia and, after a period of observation for motor and sensory deficit, the vessel is permanently ligated.

It is suggested that precipitous changes in blood pressure before and after the surgical procedure be avoided. A total of 12 cases are presented, and there were 2 deaths after ligation, both in patients over the age of 50 years. Good results were obtained in the remainder of the cases, but postligation neurologic deficits were not mentioned. It is interesting that the authors suggest ligation of the internal carotid artery in the neck, but examination of their charts and tables shows that in all patients except 2 the common carotid artery was ligated. —*Richard A. Davis, M.D.*

Aneurysms of the Great Vein of Galen and Midline Cerebral Arteriovenous Anomalies. JOHN LITVAK, MELVIN D. YAHR, and JOSEPH RANSOHOFF. *J. Neurosurg.*, 1960, 17: 945.

IN REVIEWING THE LITERATURE on this subject the authors conclude that failure to differentiate between the singular aneurysm of Galen and other racemose malformations in this region leads to considerable confusion.

The three distinct categories of midline arteriovenous anomalies are defined by the authors as follows: (1) aneurysm of the great vein of Galen, a singular dilatation of this vein fed directly by anomalous branches of the carotid and/or basilar circulation; (2) racemose conglomerations of blood vessels deep in cerebral structures with dilated deep venous drainage; and (3) transitional types of midline arteriovenous shunts, consisting of singular vascular dilatations other than of the great vein of Galen draining into dilated sinuses and deep veins, or combinations of midline angiomas accompanied by one or more aneurysmally dilated vessels.

Illustrative cases for each group are presented including arteriograms, pneumoencephalograms, and operative experience. The authors' surgical experience with these malformations suggests that the aneurysmal dilatation of the great vein of Galen is surgically removable, and operation should be performed when the diagnosis can be established. It is their conclusion that this malformation if untreated is incompatible with normal development and leads to hydrocephalus, compression of the brain stem, and cardiac decompensation. In contrast, the authors believe that the arteriovenous anomalies with dilated deep venous drainage occurring in and about the same region are not amenable to surgical treatment within the limits of present day technique. They stress the need for the use of hypothermia in treating any of these patients.

Brachial Cerebral Angiography. ROBERT A. KUHN. *J. Neurosurg.*, 1960, 17: 955.

IN AN ATTEMPT to simplify the complete cerebral angiographic study of the head and neck with a minimal risk, the author has utilized brachial angiography. One retrograde injection into the right brachial artery illustrates two-thirds of the total cerebral circulation. More than 200 adults and children have been studied with this technique with no morbidity or mortality.

The brachial artery is exposed in the distal part of the bicipital groove with special care being taken to avoid trauma to the median nerve since this may cause annoying persistent paresthesias. The vessel is occluded distally and a 12 gauge (15 gauge for a child) cannula 8 cm. in length, fitted with stylet and stopcock, is inserted. Thirty c.c. of 50 per cent diatrizoate sodium are injected as rapidly as possible. Serial exposures are taken beginning just as the plunger starts. When the cannula is removed a suture of No. 6-0 black silk is used to close the opening. No patient has shown evidence of impaired circulation in the right upper extremity. No mention is made of any difficulties associated with an abnormally high bifurcation of the brachial artery.

The author then discusses the general problem of cerebral arteriography citing numerous references related to this subject. With brachial angiography one avoids a tearing or lacerating injury to an already diseased artery, as well as the risk of dislodging a thrombus. The possibility of the injection entering the sheath of the vessel is eliminated. There is no problem with cervical hematoma. These facts are used to support the author's belief that brachial angiography represents an important step toward safe, artifact-free, physiologic visualization of the total cerebral circulation. —*Robert G. Ojemann, M.D.*

Neurologic and Surgical Experience in Arnold-Chiari Malformation. S. LAVY, Z. EYAL, and A. SCHWARTZ. *Acta neurochir.*, Wien, 1960, 8: 532.

THE CASE REPORTS of 10 patients with Arnold-Chiari malformation are presented. Some of these patients were operated upon. The symptoms and neurologic findings were varied and not diagnostic. Mental changes are correlated with the degree of hydrocephalus present. Platybasia and basilar impression could be demonstrated in 6 patients. Pneumoencephalograms showed hydrocephalus in 6 patients. Myelograms were performed in 4 patients and demonstrated herniation of the cerebellar tonsils.

Of the 7 patients operated upon, 6 were improved; 3 of these markedly, 1 moderately, and 2 slightly. The patients most improved were younger and had the shortest duration of symptoms. These conclusions were supported by a review of the literature. Although the older patients improved little, if any, neither did their disease appear to progress.

—*Sanford Larson, M.D.*

The Cerebrospinal Fluid Valves. KEASLEY WELCH and VERNER FRIEDMAN. *Brain*, Lond., 1960, 83: 454.

THE TRADITIONAL CONCEPT that an arachnoid villus is a blind diverticulum of the arachnoid into a venous channel and that it serves as a membrane through which cerebrospinal fluid passes into the blood has been re-examined by experiments in monkeys. It has been shown that in actuality the arachnoid villi are labyrinths of small tubes which establish open connections between the subarachnoid space and the venous blood. These tubes are opened by the pressure of the cerebrospinal fluid when this is sufficiently greater than the pressure of the blood in which the arachnoid villi are being bathed. If the pressure of the blood is greater than the pressure of the cerebrospinal fluid, then these tubes collapse and a tubular structure can barely be discerned if at all. Therefore, these arachnoid villi are valves as described by Harvey Cushing in 1901. This one-way valve action of the

arachnoid villi explains why not only whole blood but also its unformed constituents fail to pass backward into the meningeal space, whereas protein as well as spinal fluid can readily pass out of the subarachnoid space into the sagittal sinus blood stream.

The arachnoid villi were studied by means of perfusions and excised preparations. Flow-pressure studies confirmed that the flow was essentially unidirectional through elastic tubes above a critical pressure which was based upon interfacial tension. No influence of colloid osmotic pressure upon the flow was detectable with these perfusion studies. The perfusion curves were based on an experimental situation and the perfusion fluid is not the same as the cerebrospinal fluid. These studies were carried out on dying tissue, the characteristics of which have often changed during an experiment. Perfusion experiments designed to measure the rates of passage of particles of various sizes to the arachnoid villi are being undertaken and will be reported separately. Some excellent plates are included showing the arachnoid villi with the tubular structure quite apparent as well as collapsed.

—Morris Sanders, M.D.

Central Mechanisms for Pain (Die zentralen Systeme des Schmerzes). R. HASSLER. *Acta neurochir.*, Wien, 1960, 8: 353.

PAIN is a manifestation of the central nervous system. Although a specific peripheral receptor system for pain does not exist, the spinothalamic tract is closely related to the experience of pain. Fibers from the spinothalamic tract run to the reticular formation, and the reticular activating system can be stimulated through them. At the level of the thalamus, a division occurs. Some of the fibers run to the cortex from the nucleus ventralis posterior while others pursue a subcortical course to the intralaminar nuclei and possibly to the center median and external segment of the globus pallidus. The author believes that in order to relieve pain by thalamotomy, the nuclei serving both subdivisions must be destroyed.

The mechanism for relief of pain by lobotomy is discussed.

It is the author's opinion that emotional and motor reactions to painful stimuli are dependent on experiences with these stimuli at an early stage of development. If such experiences have not occurred, the patterns of behavior associated with painful stimuli do not properly develop. *—Sanford Larson, M.D.*

***p*H Toxicity in Intracarotid Injections.** R. LEWIS WRIGHT. *Ann. Surg.*, 1960, 152: 941.

RECENT ADVANCE in the diagnosis and treatment of neurologic disorders have led to an increasing administration of various compounds via the carotid artery. This study evaluates in detail the effect of the *p*H of the solution given in cats.

The carotid artery was isolated and occluded proximally during the injection. The external carotid was ligated distal to the pharyngeal artery. Saline solutions of the desired *p*H adjusted by hydrochloric acid and sodium hydroxide and at body temperature were given. Continuous electroencephalographic and electrocardiographic recordings were made. In one group of animals the changes in the blood-brain barrier were studied with trypan blue 20 to 72 hours after injection. In a second study the pial vessels were observed directly with a dissecting stereomicroscope during intracarotid injection.

Clinically, the most striking effect was respiratory depression encountered with the alkaline solutions. This began at *p*H 8 and 9 and complete arrest of respiration occurred over *p*H 10. On the other hand, acid solutions were well tolerated until *p*H 1 was reached. In those animals studied with trypan blue, the blood-brain barrier was damaged at *p*H 1, 12, and 12.5 with staining of the inferior frontal and inferior temporal lobes. These 3 animals also had generalized seizures in spite of the sodium pentobarbital anesthesia. The EEG recordings revealed bursts of spikes in those animals receiving solutions at *p*H 1, 9, 10, 12, and 12.5. At *p*H 3, 5, and 8 nonspecific slow waves were seen.

The studies carried out during direct observation revealed that the most marked changes were in the arterioles, 9 to 20 microns. Alkaline solutions caused constriction and as the *p*H increased larger arteries also narrowed. At *p*H 11 all arteries became constricted immediately followed by dilatation and evidence of vessel wall damage. No change was observed with acid solutions until *p*H 3 when arteriolar dilatation began. *—Robert G. Ojemann, M.D.*

Initial Experiences with the Intracerebral Injection of Etopalin in the Dog. WILLIAM E. HITSELBERGER, ROBERT J. WHITE, COLIN S. MACCARTY, and ROBERT C. BAHN. *Proc. Mayo Clin.*, 1960, 35: 710.

CONSIDERABLE INTEREST AND CONTROVERSY have developed concerning the feasibility of ameliorating the tremor and rigidity of parkinsonism and other disturbances of movement by the direct injection of various substances into portions of the brain. Perhaps the most widely used of these substances is etopalin, a highly viscous liquid composed of ethyl cellulose, 95 per cent alcohol, and ethyl iodophenylundecylate (pantopaque). Because of the paucity of experimental information on this agent, a study was undertaken in which etopalin was injected into the brains of 18 dogs. This article is a preliminary report on the clinical effects on the animals as well as on the gross pathologic changes.

Clinically, although no evidence of tremor, rigidity, isolated motor weakness, or convulsive activity was noted, the animals nevertheless manifested considerable lassitude for several days after the operation. The mortality rate associated with intracerebral injection of etopalin was 18 per cent. The clinical appearance of the animals that died after the procedure suggested coma or extreme lethargy without evidence of any localized neurologic defect.

Grossly, etopalin produced three types of destructive effect. The first type of lesion was a well localized, sharply demarcated area of necrosis in the basal ganglia or thalamus without involvement of neighboring structures. The second type was a larger area of hemorrhagic necrosis which usually involved both the thalamus and the basal ganglia. The third type of lesion was a widespread, dissecting type of lesion which extended in some brains from the basal ganglia down through the midbrain and distal portion of the

brain stem. Reflux of the etopalin along the tract of the needle into the ventricular system was common.

Supratentorial Meningiomas of the Child (Les méningiomes sus-tentoriels de l'enfant). J. LECUIRE, C. LAPRAS, M. TOMASI, and G. TUSINI. *Neurochirurgie*, Par., 1960, 6: 147.

OF 350 patients with meningiomas operated on at the Centre Neurochirurgicale, Lyon, France between 1933 and 1958, only 6 or 1.7 per cent were children less than 15 years of age. This conforms with previously published statistics. The clinical and laboratory findings of the 6 cases were given. The children were 6, 10, 11, 11, 14, and 14 years old, respectively, when first seen.

Four of these patients had Jacksonian seizures. One, with a large meningioma on the upper surface of the tentorium on the left, had had 10 months of headache and vomiting and later a right homonymous hemianopsia. Another, with a meningioma on the floor of the right anterior fossa, had a left strabismus, obesity, and a bitemporal hemianopsia. All patients had carotid arteriograms or ventriculograms made under general anesthesia.

There was 1 death on the first postoperative day. Another patient died of meningitis 1 month postoperatively. The others did well, only 1 having a persistent electroencephalographic abnormality. Pathologically, three meningiomas were of Cushing's fibroblastic type; two others were more compact, less differentiated, and with tendency to rosette formation.

—George L. Potter, M.D.

Hypophysial Stalk Section, Especially as Related to the Treatment of Breast Cancer (La section de la tige de l'hypophyse en particulier dans le traitement du cancer du sein). J. LE BEAU. *Neurochirurgie*, Par., 1960, 6: 128.

THE AUTHOR PERFORMED 20 stalk sections in 4 years at the Lariboisiere Hospital, Paris, France. Fourteen of them were performed for breast carcinomas. He evolved a technique employing an acrylic paste which forms a tight plastic cover over the diaphragma sellae, thus preventing revascularization of the stalk and adenohypophysis. This procedure has always reduced markedly the assays of the follicle stimulating hormone. It has had an inconstant effect on urinary 17-ketosteroids. In most cases, the metabolic rate and I^{131} uptake have been lowered, blood cholesterol level increased, and the glucose tolerance curve flattened. Stalk section thus seems to affect markedly the pituitary control over the genital organs, moderately, that over the thyroid, and little that over the adrenal glands.

Liver metastasis is considered the greatest contraindication to hypophysial surgery.

Postoperatively, the patients are given 10 to 15 mgm. of cortisone daily. Transitory diabetes insipidus is treated with pituitrin.

The best result was that in a 55 year old woman with breast carcinoma metastatic to the lung and to the fifth thoracic vertebra, resulting in a compression fracture of the latter and an incapacitating paraparesis. After stalk section and plastic capping of the sella she recovered completely from the paraparesis and is still alive 15 months postoperatively.

—George L. Potter, M.D.

SPINAL CORD

Spinal Peripachymeningitis. VINCET DÓS. *J. Neurosurg.*, 17: 972.

SPINAL PERIPACHYMENINGITIS is an inflammatory process of the epidural tissue and dura mater. Other terms applied to this entity are epidural granuloma, epidural abscess, perimeningitis, peridural phlegmon, and purulent perimeningitis. Between 1948 and 1957 8 patients with this relatively rare condition were treated at the University of Pécs Medical School, Pécs, Hungary. These case reports form the basis of this article.

In 5 patients the condition was termed acute or subacute, neurologic symptoms and signs developing 2 to 18 days prior to operation, whereas in 3 chronic cases the interval was 3 to 18 months. Three patients had a history of a previous purulent process. The first symptom in 7 of the 8 was segmental pain. The pain was followed by paresis within 1 to 7 days in the acute cases and in 2 to 4 months in the chronic cases. The thoracic region was involved four times, one lesion extended from the fifth cervical to the seventh thoracic level and the other 3 were in the lumbar region. Tenderness over the spines of the involved area was present in all but 1 case. No evidence of disease was revealed by roentgenography in 7 cases although it is known that peripachymeningitis may be associated with vertebral osteomyelitis. Care must be taken in choosing the site of lumbar puncture to avoid transmission of the infection to the subarachnoid space. In acute cases the diagnosis may be established by puncture of the epidural space.

A review of the literature revealed a few cases in which conservative treatment by local administration of antibiotics had been carried out. The author, however, believes that immediate laminectomy combined with antibiotic therapy is the treatment of choice. Six of the operative specimens were cultured. Five of the cultures showed Staphylococcus aureus and 1 was sterile.

One patient first seen in the late stages of the disease died after operation. Two patients with acute symptoms and 1 with chronic disease have no complaints 6 or less years after the operation. Two other patients have minimal neurologic deficits but their degree of activity is not recorded. Two others have more severe neurologic disabilities but 1 is able to do light work. The need for early diagnosis and treatment is emphasized. *—Robert G. Ojemann, M.D.*

SURGERY OF THE INTEGUMENT AND CONNECTIVE TISSUES

SKIN AND SOFT TISSUES

Prolonged Skin Homograft and Heterograft Survival in Patients with Neoplastic Disease. REUVEN K. SNYDERMAN, DANIEL G. MILLER, and JESUS G. LIZARDO. *Plast. & Reconstr. Surg.*, 1960, 26: 373.

THE AUTHORS followed the approach of Southam and associates and found that tumor transplanted into patients with tumor survived, whereas tumors transplanted into normal volunteers were rejected. Therefore, they transplanted skin homografts into patients with cancer to see if a similar pattern of survival developed. Sixty-five such patients were homografted. Fifty-eight patients maintained their graft long enough for useful statistics on graft survival to be gathered. The long term survival was 36 per cent.

One of the unique things about this report is that these researchers utilized the new microscopic test of graft survival, in that they used female skin on male patients when possible to demonstrate the survival of the skin not only by the appearance of the graft but also by the presence of female sex chromosomes. Their conclusions are that their attempt to determine the difference between cancer patients who reject and those who hold skin homografts has led only to negative information.

Ten patients were treated with heterografts of pig skin. One of these patients held the heterograft for 68 days. Electrophoretic studies were carried out and immunologic studies were followed parallel to the research skin testing in an attempt to seek a clue as to why one group of cancer patients accepted the homografts while a similar group rejected them. The same studies were used in the heterografts. While this great effort has been disappointing because of the negative findings, it has served certain useful purposes. It showed the necessity of careful evaluation of the cancer patient on the basis of a possible close relationship between his ability to hold a homograft and his ability to hold a tumor. There seems to be some close relationship. Patients who have cancer and who will hold a homograft may in the future be in need of replacement of some organ, or the possibility of transplantation of bone marrow may be valuable. The postulation is that since they hold a skin homograft the possibility of holding these other tissues may well exist. —*Henry S. Patton, M.D.*

Hemangiopericytoma. JOHN H. FISHER. *Canad. M. Ass. J.*, 1960, 83: 1136.

A REVIEW of 20 cases of hemangiopericytoma is presented in which the clinical and pathologic features of the disease are discussed. The tumor is one of vascular origin which may occur both in external soft tissues, especially in the thigh, and in internal soft tissues including the viscera. It is locally infiltrative and metastasis occurred in 45 per cent of the cases in this series, spreading by either hematogenous or lymphatic routes, most commonly to local nodes, lungs, or vertebrae. It consists of a rich vascular component of numerous capillaries with the neoplastic pericytes closely packed in or about the vessels. There were no remarkable age or sex variations. A long duration of the clinical course was common and the tumor was usually of large size when first seen, with the patient noting a mass prior to other symptoms. It is difficult to differentiate on histologic appearance alone the metastasizing from the nonmetastasizing variety. The nonmetastatic tumors demonstrate locally aggressive and infiltrative growth with a high rate of recurrence after simple local excision. It is advised to treat hemangiopericytoma by wide radical excision initially. Hemangiopericytoma is unexpectedly radioresistant in spite of its rich vascular component.

Hemangiopericytoma must be differentiated from other neoplasms and may be confused with highly vascular fibrosarcomas, leiomyosarcomas, or occasionally, reticulum cell sarcomas. Hemangiopericytoma is distinguished from endothelial neoplasms by a reticulum stain which demonstrates the neoplastic cells outside the vascular sheath in hemangiopericytoma. The glomus tumor, which is also derived from pericytes, may be differentiated from the hemangiopericytoma because of its organoid pattern of pericytes and because it is usually painful, circumscribed, and always benign.

Of the 20 patients in the series 9 have been treated by operation alone, 3 by roentgenotherapy alone, and the remainder by a combination of operation and irradiation with cobalt. Of the original 20 patients 10 show no evidence of recurrent disease whereas 7 died as a result of hemangiopericytoma and 3 are alive with residual tumor.

The author emphasizes that the potentialities o both the local and metastatic form of hemangiopericytoma have been underestimated and that simple excision is not adequate. Hemangiopericytoma is not common but must be entertained in the differential diagnosis of soft tissue tumors. Its diagnosis is made by thinking of the possibility and recognizing characteristics. —*Patrick E. Jewell, M.D.*

BREAST

Differential Diagnosis in Mammary Hypertrophy (Die Mammahypertrophie und ein Beitrag zu ihrer Differentialdiagnose). H. Güss. *Med. Welt*, 1960, p. 1622.

A GENERAL SUMMARY of the problem of differential diagnosis is offered, and 2 cases with fatal outcome are described. In both cases, diseases of the leukopoietic system were the underlying causes. A 20 year old woman had mammary hypertrophy caused by a reticulum cell sarcoma with metastasis to both ovaries. Another case involved a 37 year old para 2 during the 8 months of gestation. Due to acute leukemia, both breasts were enormously enlarged by leukemic infiltrates. Both patients died, for the underlying disease could not be reached therapeutically.
—*Otto Weiss, M.D.*

Observations and Reflections on Breast Cancer. RICHARD HANDLEY. *J. R. Coll. Surgeons Edinburgh*, 1960, 6: 1.

THE AUTHOR touches briefly on the technique of breast examination in early breast cancer, passes on to discuss internal mammary lymph nodes, and gives his views on methods of treatment of "operable" breast cancer.

The lymphatic anatomy of the breast should be rewritten, since in vivo studies of how the breast disposes of dyes and radioactive substances, show that about 75 per cent of the lymph leaving the breast goes to the axilla, 20 per cent goes to the internal mammary chain, and probably about 5 per cent enters the intercostal spaces directly along the lymphatics which run with the lateral perforating vessels to reach the lymph nodes on the necks of the ribs. Handley began performing routine consecutive internal mammary lymph node biopsies in 1946.

Of 350 of a series of 380 biopsies the internal mammary nodes and/or axilla were found to be invaded in 104 cases, a total of 29 per cent involvement of the internal mammary chain. In 122 cases the axilla only was invaded, and in 124 cases all nodes were free. When the primary breast tumor was in the inner hemisphere or centrally located, 41 per cent of the internal mammary and axillary nodes were positive for tumor, and when the outer hemisphere was invaded by the primary tumor, 18 per cent of the internal mammary and axillary nodes were involved. Twelve of 350 patients were considered clinically inoperable. The important point is that, based on the findings of internal mammary chain biopsy, nearly one-third of the operable patients were not curable by the Halsted type of mastectomy, because metastases were present in the internal mammary chain at the time of operation.

Two hundred patients are reported who were treated 5 or more years previously by radical mastectomy and additional roentgenotherapy if nodes were found to be invaded. In those patients in whom all nodes were free, there is a 78 per cent survival for 5 years free of disease. Of the patients in whom both axillary and internal mammary nodes were involved at the time of operation, 72 are now dead and only 13 per cent are alive and free from disease.

Patey's operation is practiced by the author. Its chief difference from other operations on the breast is the claim that it has the same efficiency in clearing the axilla without sacrificing the pectoralis major muscle. Early in the dissection, tissue for intercostal node biopsies is taken from the first, second, and often the third intercostal spaces, the internal mammary vessels being reached by splitting the pectoralis major muscle in the direction of its fibers and gently dividing the intercostal muscles. If the internal mammary nodes are positive the author considers it an indication for completing the operation as a simple and not a radical mastectomy. Skin grafting is required in nearly one-half of the patients because the flaps are thin and will not stand tension; the presence of the pectoralis major muscle increases the surface area to be covered but provides an ideal bed on which the skin grafts will take with almost absolute certainty. Roentgenotherapy is given only to those patients in whom the pathologist reports invasion of lymph nodes.

The author concludes that radical mastectomy is really not radical at all, and that its advantages can be encompassed by a procedure which is less mutilating. —*Wayne F. Cameron, M.D.*

SURGERY OF THE THORAX

TRACHEA, LUNGS, AND PLEURA

Neurosurgical Applications of Tracheotomy (Les applications neurochirurgicales de la trachéotomie). PIERRE WERTHEIMER and JACQUES DESCOTES. *Acta chir. belg.*, 1960, 59: 562.

TRACHEOTOMY reduces respiratory dead space and respiratory effort. Free respiratory exchange aids in the prevention of hyperthermia, a major neurosurgical peril.

Of 261 tracheotomies performed for neurosurgical conditions, cranial trauma was the indication in 196 instances from the twelfth to the thirtieth hour after injury. Complications were few, but severe pulmonary infection, at times gangrenous, occurred 29 times after operation. Seventy per cent of patients undergoing tracheotomy died, but these patients were comatose and seriously ill. Critical analysis of these deaths led the authors to estimate that tracheotomy was probably responsible for the death in 4 per cent of cases.

The chief indication for this procedure was inability of the patient to clear the tracheobronchial tree. Artificial respiration of comatose patients was facilitated by connection with the tracheotomy tube. The tubes were usually not left in place more than 10 days. The authors consider tracheotomy to be a useful procedure in the care of neurosurgical patients.

—John H. Wulsin, M.D.

Operation for Primary Tumors of the Trachea (Chirurgie des tumeurs primitives de la trachée). J. MATHEY, B. DENIS, and J. P. BINET. *Ann. chir.*, Par., 1960, 14: 1343.

PRIMARY TUMORS of the trachea, such as cylindromas and carcinoids, are rare. Fewer than 600 have been reported in the literature. Of these, only 44 were resected. The authors report 6 cases, in 4 of which resection was carried out. Five of the lesions were cylindromas and 1 was a carcinoid tumor. The authors consider these tumors to be of low grade malignancy and therefore believe that their resection is worthwhile despite the problems of tracheal reconstruction. They note that these tumors are more frequent in females, 5 of their 6 patients were women, and that all age groups are affected. The middle third of the trachea is less frequently affected than is either end. The bulk of this tumor is usually extratracheal, the iceberg phenomenon. Since the onset of symptoms is insidious and the roentgenographic findings are delayed, the diagnosis is usually made after a lapse of about 2 years. The authors condemn the use of roentgenotherapy, since these tumors are roentgen ray resistant except for palliation in case of tracheal or caval obstruction. The same condemnation applies to the use of endoscopic resections and electrocoagulation.

The authors believe that wide surgical resection with lymph node dissection offers the patient the best form of treatment. This, of course, results in the problem of repairing the tracheal defect. On the other hand, more limited resections would result in a higher recurrence rate. With circular resections, not more than 5 cm. of trachea can be sacrificed to allow a direct anastomosis. If more is resected a prosthesis will have to be used. Of the numerous types of prostheses used by different surgeons, none has been uniformly successful. In case the tracheal defect is lateral and noncircumferential, direct suture is possible if the defect is less than 3 cm. in length. This repair will result in a slight but unimportant angulation of the trachea. For larger lateral defects various prostheses and pedicled grafts have been used successfully by various surgeons. The authors prefer the method of Gebauer which consists of a skin graft reinforced with steel wires. In case the resection involves the tracheobronchial bifurcation, different types of direct anastomosis are possible depending upon the local situation. The most pressing problems in these cases are the maintenance of oxygenation by intubation of one or both lungs at the operating table. The authors suggest in such a situation the use of a heart-lung machine, although they have not yet had the opportunity to use one.

—Joseph J. Bahuth, M.D.

The Nomenclature of the Bronchopulmonary Segments and Their Blood Supply. EDWARD A. BOYDEN. *Dis. Chest.*, 1961, 39: 1.

IN 1960, the Seventh International Congress of Anatomists accepted a revision of the Bronchopulmonary Nomenclature which had been adopted in 1949. The left medial basal bronchus, omitted as an entity in 1949, is recognized in the recent revision.

Further attention is given to a nomenclature for the pulmonary arterial supply and, likewise, for the pulmonary veins. In general, the corresponding segmental name is applied to a vein which is closely associated at the hilum with the bronchus of a bronchopulmonary segment.

This article consists chiefly of 3 tables presenting the official nomenclature of the bronchi and pulmonary arteries and veins in outline form. It is advisable that all clinicians dealing with bronchopulmonary problems familiarize themselves with this nomenclature.

—Frank J. Milloy, M.D.

Fracture of the Bronchial Tree Following Blunt Chest Trauma. CLIFFORD O. BISHOP, ARTHUR C. MILLER, and BUFORD H. BURCH. *West. J. Surg.*, 1960, 68: 345.

THIS ARTICLE reports 4 patients with bronchial tree fracture and reviews the literature covering 80 patients whose reports are available and adequate.

In discussing early diagnosis, the authors point out that physical signs are not totally reliable and in only 15 per cent of the 80 patients was the diagnosis made during the first week after the injury. Pneumothorax was present in only about half of the patients, and tension pneumothorax in about one-seventh. They state, however, that after severe blunt trauma to the chest, in the presence of a pneumothorax, when the

lung fails to expand after several hours of underwater suction drainage, a major leak from the bronchial tree should be suspected.

In discussing the late diagnosis, they point out that the late phase may begin 1 week or more after the injury, and 1 patient reported was treated 19 years after injury.

In this late phase there is atelectasis. Evidences of suppuration, bronchopleural fistula, or chronic empyema may or may not be present. Dyspnea on slight exertion and chest pain are common late symptoms. The diagnosis is usually established by physical examination, fluoroscopy, and chest roentgenograms. Bronchoscopy and bronchograms may show partial or complete bronchial obstruction.

In early treatment, the patient is seen in the early phase of the injury. Immediate thoracotomy with suture of the fractured bronchus is usually adequate treatment. The usual management by underwater suction is commonly used, but in the absence of satisfactory exposure, thoracotomy is considered indicated. In only 12 patients of the 54 subjected to thoracotomy was the operation performed within the first week after the injury.

In late treatment, in the common instance in which there is pulmonary suppuration distal to the stricture, excision of the infected pulmonary tissue is usually required. In the less common instance, with complete severance of the bronchus and atelectasis without infection, the choice of treatment will often be excision of the stricture and anastomosis of the severed bronchus.

In discussing the prognosis, the authors point out that associated injuries will have a great influence on the prognosis. Injury of a large vessel may be responsible for early deaths. In the more detailed reports of their own 4 cases, the first patient had tension pneumothorax which was treated with suction. After 4 days there was no improvement in the leak and the chest fluid became purulent. A fractured bronchus was diagnosed preoperatively, and at thoracotomy the lacerated lung and the fractured bronchus were sutured. The patient made an uneventful recovery. The second patient had a blunt injury to the chest from which he seemed to have a suitable recovery. However, 5 months later, because of chest pain and dyspnea, he was rehospitalized and a diagnosis of pneumonia was made. Bronchoscopy disclosed a collapse to the left lower bronchus without cartilaginous support. The patient continued to be anemic and toxic and was deteriorating when he was operated upon and a huge empyema cavity was drained. Decortication was impractical. A left pneumonectomy was performed with prompt recovery of the patient. The 2 additional patients have not been treated with thoracotomy, although the nature of their symptoms suggested that they both have bronchial injury.

—*Ward D. O'Sullivan, M.D.*

Surgical Management of Tuberculous Pyothorax (Traitement chirurgical des pyothorax tuberculeux). M. Jaubert de Beaujeu, R. Latreille, and Y. Meyer. *Lyon chir.*, 1960, 56: 716.

Chronic pyothorax is the clinical form most often encountered, i.e., empyema more or less stabilized by chemotherapy and/or after bronchopleural fistula or blood-borne infection; acute empyema and primary tuberculous pleuritis are now relatively uncommon. The chronic form, then, is associated with major, irreversible, parenchymatous disease. Superinfection with staphylococci, pseudomonas, and other environmental bacteria is frequently encountered; sterile empyema less so.

The purpose of treatment is eradication of the pleural suppuration and restoration of optimal pulmonary function. Older therapeutic approaches, drainage, decortication, and thoracoplasty, each having individual disadvantages, employed still whenever radical operation is contraindicated, give good results in about 50 per cent of patients. Direct surgical attack—pleurectomy-decortication or pleurectomy with pulmonary resection of a lobe or lung—gives good results in 88 per cent of patients. Special attention must be given to and ultimate success depends upon obliteration of residual pleural pockets and other dead space by thoracoplasty or needle aspiration, if recurrence of pyothorax is to be avoided. Cardiopulmonary preoperative workup is mandatory. The advantages of more radical surgery are more rapid, more permanent cure. Results of treatment are tabulated and discussed.

—*Edwin J. Pulaski, M.D.*

Preoperative Treatment of Bronchogenic Cancers with the Betatron (Le traitement pré-opératoire des cancers bronchiques par le bêtatron (22 MeV)). J. Delarue, B. Pierquin, Ph. Daumet, R. Depierre, and Others. *J. fr. méd. chir. thorac.*, 1960, 14: 661.

High energy radiation can be applied with profit under certain circumstances in patients with bronchogenic cancer: (1) to anaplastic tumors that are not very large, and (2) to epidermoid tumors that are inoperable because of local causes, when there is no cavitation and when the tumor is not too large. High energy radiations may be used with a cure in mind for small epidermoid tumors whenever there exists a contraindication to surgical treatment or when the patient refuses to accept surgical intervention.

The authors use a betatron as a source of radiation. The exact site of the lesion is accurately determined by tomography. The treatment lasts for 6 to 8 weeks, during which time a tumor dose of 5,500 to 7,500 r is given.

When preoperative radiation is used, the operation performed is always a pneumonectomy. This is necessary because of the radiation reaction which makes dissection of the hilus more difficult and makes lobectomy impractical. The interval between the last radiation treatment and pneumonectomy varies from 15 days to 6 weeks.

The authors' material is based on a study of 65 unselected cases of patients with bronchogenic cancer who appeared at the clinic during a year. Fifteen of these had distant metastases or were ineligible for therapy because of poor condition. Fifteen were irradiated. In 6 patients complications attributable to radiation developed. Metastases developed in 7 patients undergoing operation. Fifteen remained inoperable after therapy, 5 refused operation, and 18 were operated upon after receiving treatment.

The cases that remained inoperable after radiation are in 2 categories. Ten patients' tumors were so advanced that insufficient regression took place to warrant operation. All of these patients died in a few months. The other categories consist of patients in whom operation was contraindicated because of age or circulatory disease.

Radiation therapy is not without danger and is followed by complications in about 10 per cent of cases. These consist of esophageal-bronchial fistula, hemoptysis, and radiation pneumonitis. The authors observed a case of esophageal-bronchial fistula to occur after 2,400 r given in a 3 week period. Autopsy of the patient showed that the fistula occurred after necrosis of intertracheal-bronchial lymph nodes. Complications can be avoided by precise application of indications and use of doses not in excess of 4,000 r. Cases in this series were followed up from 3 to 55 months, not long enough for evaluation of end results.

—*Frederick W. Preston, M.D.*

Bronchial Carcinoma. L. HENRY GARLAND. *California M.*, 1961, 94: 7.

THE OPINION has been expressed that peripheral bronchogenic carcinomas seem on occasion to develop in old cicatrices, sites of obsolete tuberculosis, or old pulmonary infarcts. The anatomic locations of 250 consecutive bronchogenic carcinomas were determined in patients at the San Francisco General Hospital, San Francisco, California.

Fifty-three per cent of the carcinomas occurred on the right and 44 per cent on the left. In 2 cases the carcinoma was multicentric. A majority of the lesions occurred in the upper lobes, the ratio of upper to lower lobe involvement being approximately 2.5 to 1. A majority of the lesions occurred in the lobar segmental bronchi rather than in the main bronchi.

In a previous study of lobar pneumonia in young persons at the same hospital, only 41 per cent of the infections were in the upper lobes. Seventy-nine per cent were in the right lung; 21 per cent were on the left.

It is, therefore, evident that there was not a good correlation between the location of antecedent pulmonary infections in young persons and bronchogenic carcinomas in older persons in 2 groups of individuals who were otherwise supposedly comparable.

—*Frank J. Milloy, M.D.*

The Pleuroscope in the Diagnosis of Cancer of Pleural Cavity (La pleuroscopie dans le diagnostic des pleurésies cancéreuses). R. TOURAINE. *J. fr. méd. chir. thorac.*, 1960, 14: 735.

A BLOODY PLEURAL EFFUSION which comes on in the absence of fever and reveals bloody or rose-colored fluid on aspiration is clinically considered to be a malignant diffusion. Although cytologic studies of this fluid are of some help, more definite information may be obtained when a biopsy is made. Three different types of biopsies have been proposed: a needle biopsy, surgical biopsy through an open thoracotomy, and a pleuroscopic biopsy. The authors have been interested in the technique of pleuroscopy for 3 years. Indications for this procedure are a pleural effusion, a pleurisy which is of 6 to 7 weeks' duration and from which cultures, guinea pig innoculations, and microscopic studies are negative. Pleuroscopy is preceded by an aspiration of as much fluid as possible and the injection of air in a large enough quantity to cause a large pneumothorax. The collapse is often limited by zones of adhesions between the parietal and visceral pleura. This decreases the visibility through the pleuroscope. Roentgenograms are taken to ascertain the completeness of the pneumothorax. Unless contraindicated, the pleuroscope is introduced below the axilla in the midaxillary line. Other sites for entering the thorax may be chosen if the lesion to be studied by biopsy is more accessible from another site. Some lesions are very inaccessible, particularly lesions just above the diaphragm.

During the 3 year period the authors have used the technique 23 times in 22 patients. In 19 cases the diagnosis of cancer was proved on biopsy.

Primary tumors of the pleura have the appearance of an irregular growth on either the visceral or parietal pleura. Primary tumors of the parietal pleura may give the appearance of a localized tumor zone, and the lung and visceral pleura appear normal. Diffuse lesions and thickened pleura with appearance of subpleural lymphangitis usually is evidence in favor of metastatic tumor.

—*Frederick W. Preston, M.D.*

Lung Cancer in Women. KATHARINE R. BOUCOT and HELEN PERCY. *Dis. Chest*, 1960, 38: 587.

ONE HUNDRED AND TWO cases of proved lung cancer in women were seen in 39 Philadelphia hospitals from 1948 through 1950. Of these patients, the 5 year survival rate was 3 per cent. Surgical exploration had been recommended in one-half of the patients, and exploration was carried out in 48 per cent of the entire group. Twenty-eight women underwent resection, a rate of 27 per cent. The operative mortality of those who underwent exploration was 6 per cent.

In evaluation of the various factors concerned, one-half the patients with normal bronchoscopic findings underwent resection, whereas of those with abnormal findings only one-fifth underwent resection. The cellular types were equally distributed: 32 undifferentiated carcinomas, 30 adenocarcinomas, 26 squamous cell carcinomas, and 4 terminal bronchiolar cell carcinomas. Only 1 patient was asymptomatic, yet delay in diagnosis was common. The index of suspicion in regard to lung cancer in women with respiratory complaints unfortunately remains low.

—*Thomas W. Shields, M.D.*

Surgical Treatment of Pulmonary Metastases from Malignancies of the Genitourinary Organs. MELBOURNE H. LENT, WILLIAM J. STAUBITZ, IMRE V. MAGOSS, and CHARLES A. ROSS. *J. Urol.*, Balt., 1960, 84: 746.

THE PROBLEM of whether or not to operate upon the pulmonary lesion after previous therapy of malignant lesions is answered affirmatively by these authors (1) if the original lesion is under control, and (2) if any other metastases are removed or are surgically operable. In the absence of evidence of any other metastatic disease, a strong indication for surgical intervention is establishment of a diagnosis, as these patients may have metastasis, benign lesions such as granulomas, or even secondary neoplasms.

The authors present the cases of 8 patients with urinary tract carcinoma operated upon for metastasis to the lungs. Six of these patients are alive, and 4 are alive and well 8 to 75 months after operations on the lung.

This problem sounds slightly esoteric, but is an important facet in the study of the natural history of carcinoma. —*John R. Herman, M.D.*

Combined Therapy of Inoperable Lung Carcinoma with 5-Fluorouracil and Irradiation. FORREST M. WILLETT, LAURANCE V. FOYE, JR., MERALL ROTH, and BYRON E. HALL. *Dis. Chest.*, 1961, 39: 38.

SIXTEEN PATIENTS with far advanced carcinoma of the lung were selected for treatment with a combination of irradiation and intravenous 5-fluorouracil. The total irradiation dose was 2,000 r given over a 12 day period. The 5-fluorouracil was given intravenously, the dosage for the first 4 days consisting of 15 mgm./kgm., not more than 1,000 mgm./day, and one-half that dose for 3 subsequent days, with 2 day intervals between the lesser doses.

Two-thirds of the patients had some evidence of toxicity, although in no case did it prevent completion of the therapeutic program or cause serious symptoms. In each of the 16 patients, there occurred unequivocal regression of the treated tumor masses within 2 weeks of completion of treatment. One of the patients who was considered terminal when treatment was begun was ambulatory and symptom free 12 months later.

Although previous experience with these two modalities has been disappointing, in the author's opinion, when used in the manner herein described, they would appear to be beneficial.

—*Frank J. Milloy, M.D.*

HEART AND PERICARDIUM

Cardiac Resuscitation. B. B. MILSTEIN. *Proc. R. Soc. M.*, Lond., 1960, 53: 845.

THE INCIDENCE of cardiac arrest is probably about 1 in 3,000 operations. In published series of cases of cardiac arrest, the mortality is 70 to 90 per cent. The immediate objective in dealing with a case of cardiac arrest is not to restart the heart but to restore the supply of oxygenated blood to the brain. Restoration of the heart beat can be achieved subsequently at leisure.

In the treatment of cardiac arrest two things are necessary to supply oxygenated blood to the brain: ventilation of the lungs and cardiac massage. The rate of massage should be about 50 per minute. It is necessary to wait for the heart to fill in diastole before it can be emptied. If the massage is effective, it should be possible to feel a pulse in a large artery such as the carotid or abdominal aorta. Once the blood supply to the brain has been re-established, one can look to restoration of the heart action. The first step is oxygenation of the myocardium by cardiac massage at the same time as the lungs are being ventilated, so that oxygenated blood is forced down the coronary arteries.

If the problem is ventricular fibrillation the first step is oxygenation of the myocardium by massage. When the fibrillation is seen to be coarse and the tone of the myocardium is felt to have increased, electric defibrillation can be tried. If one shock is not effective, serial defibrillation should be used. The essential feature is speed in initiating treatment. Its achievement is not easy, but it is the only means by which to reduce the heavy mortality from this condition, as it can be reduced, to no more than 10 per cent.

—*Robert A. Nabatoff, M.D.*

Coarctation of the Aorta. M. H. FRICK and PENTTI I. HALONEN. *Ann. med. int. fenn.*, 1960, 49: 137.

THIS STUDY is based on the cases of 110 patients with coarctation of the aorta collected from several different hospitals and clinics in Helsinki, Finland. The males outnumber the females, 2 to 1. The coarctations were abdominal in 2 cases and in the remainder were isthmic. Associated defects in 22 cases included patent ductus, aortic valve lesions, septal defects, and mitral regurgitation.

The usual clinical features of coarctation of the aorta are reviewed. The greatest elevation of the blood pressure in the upper extremities occurred between the ages of 10 and 20 years and although it is high for several years the patients may have small and vertical hearts. One-half the patients had left ventricular hypertrophy and in only one-fourth did the heart volume exceed the upper limit of normal.

This series included 22 patients who had altogether 48 pregnancies. In 1 patient operation was performed before gestation. These 48 pregnancies terminated in normal pelvic delivery in 32 cases, in abortion in 4 cases, and in therapeutic abortion in 8 cases. Cesarean section was performed in 4 patients. Neither cardiovascular nor obstetric complications occurred which could be attributed to the combination of coarctation and pregnancy.

Corrective operation was performed on 38 patients and consisted of resection with end-to-end anastomosis in 33 cases. Because of a long, narrow segment in 5 cases an anastomosis between the subclavian artery and the aorta was performed and the results in these cases were as good as in the others. Over-all results after operation were good in 65 per cent and satisfactory in 29 per cent and in 3 cases there was little or no improvement.

Although the mean age for patients operated on in this series is 21 years, the authors note a tendency by other surgeons to lower the age for operation with recommendations of 3 and 4 years.

—*George R. Holswade, M.D.*

A New Technic for Left Ventricular Angiocardiography and Transseptal Left Heart Catheterization. EDWIN C. BROCKENBROUGH and EJGENE BRAUNWALD. *Am. J. Cardiol.*, 1960, 6: 1062.

AT THE NATIONAL Heart Institute, Washington, D.C. experiences with transseptal catheterization of the left side of the heart in 300 patients have demonstrated the advantages of this approach over other methods of catheterization. A modification of this technique is described, the chief advantages of which are that selective left atrial and left ventricular angiocardiography may be performed in conjunction with transseptal catheterization and that surgical exposure of the saphenous veins is not necessary. The technique is accomplished through percutaneous puncture of the

right femoral vein and the introduction of a series of guide wires, radiopaque polyethylene catheter, stylet, and transseptal needle. The catheter which is finally manipulated into the left atrium and left ventricle is of greater caliber than those previously used, but there has been no evidence of persistent openings in the atrial septum after its use.

There were no significant complications in 30 patients in whom this technique of catheterization of the left side of the heart was used. Angiocardiography was performed in 8 patients. The left ventricle was entered in 29. By this method multiple catheterizations may be carried out in any given patient since surgical excision and ligation of the saphenous vein are not necessary. —*George R. Holswade, M.D.*

Transseptal Catheterization of the Left Heart. ROBERT T. SINGLETON and LEONARD SCHERLIS. *Am. Heart J.*, 1960, 60: 879.

TRANSSEPTAL CATHETERIZATION of the left side of the heart was carried out in 56 patients with cardiac disease according to the method originally described by Ross at The National Institutes of Health. This method involves puncturing the interatrial septum through a catheter inserted into the right atrium via a saphenous vein. Through this long needle small polyethylene catheters can be introduced to explore the right side of the heart.

In every case satisfactory pressure tracings were recorded from the left atrium. Initially, entry into the left ventricle was not attempted, but, in 42 patients, when an attempt was made, the left ventricle was entered in 30, or 71 per cent. The aorta was entered in 5 cases, but only rarely was an attempt made to manipulate the catheter into the aorta, since in each patient peripheral systemic pressures were recorded. The quality of the left ventricular pressure curves was similar to those recorded percutaneously through the back. Indicator substances may be introduced into the left atrium through the transseptal needle.

There were no serious complications. On three occasions patients experienced momentary discomfort as the needle pierced the septum. The aorta was pierced in 1 patient with no complications after its withdrawal. In 2 patients subsequently undergoing mitral valvotomy there was blood-stained pericardial fluid and it was assumed that a puncture of the atrial wall had occurred during the transseptal procedure.

The authors believe that the transseptal technique is the most convenient and least traumatic method of approach to the left side of the heart. The comfortable position of the patient permits basal and exercise studies. —*George R. Holswade, M.D.*

Detection of Intracardiac Shunts by an External Surface Counting Technic. JOHN D. TURNER, EDUARDO SALAZAR, and RICHARD GORLIN. *Am. J. Cardiol.*, 1960, 6: 1004.

A METHOD of detecting intracardiac shunts by the intravenous injection of radioactive iodinated serum albumin and determination of the radioactivity recorded through a scintillation counter probe placed in the precordial region is described. This method was studied in 23 patients with intracardiac shunt, all of which were left-to-right save 2. Precordial indicator dilution curves were recorded over each ventricle separately.

The presence of multiple "recirculation humps" on the right-predominant dilution curve was evidence for a left-to-right shunt. This technique did not differentiate between atrial and ventricular septal defects, but the left-to-right shunt of a patent ductus arteriosus could be identified. Tricuspid insufficiency tended to produce a "smearing" of the dilution curve. Early arrival of the isotopes in the left-predominant dilution curve was presumptive evidence for the existence of a right-to-left shunt. Proper interpretation depends primarily upon critical placement of the probe over the precordium.

Although the authors state that this method can be used effectively as a screening test for cardiac catheterization and to determine postoperatively the success of surgical closures of septal defects, they admit that it cannot clearly demonstrate shunts of less than 30 per cent. —*George R. Holswade, M.D.*

Thermal Dilution Curves in the Study of Circulatory Shunts. THEODORE COOPER, EUGENE BRAUNWALD, GRANT C. RIGGLE, and ANDREW G. MORROW. *Am. J. Cardiol.*, 1960, 6: 1065.

THE INDICATOR DILUTION CURVE TECHNIQUE is a most useful means of detecting circulatory shunts without the necessity for withdrawal of samples from the blood stream. A technique involving the use of cold saline as the indicator is described and is compared with standard dye dilution methods.

The instrument developed for this method consists of a transistorized direct current amplifier which when used with a thermistor permits the recording of stable linear thermal dilution curves. Intra-arterial detection was accomplished with the thermistor incorporated in the tip of a 20 gauge hypodermic needle or in a segment of polyethylene or teflon tubing which could be introduced through a Cournand needle. The hazard of electric shock is prevented by the use of low bridge voltage.

Thermal dilution curves were recorded on a total of 20 patients in the course of cardiac catheterization or during an operation and were compared with cardiogreen dye dilution curves which were either recorded simultaneously or immediately after the thermal dilution curves. With the thermal detector inserted into the brachial artery in a normal individual and the cold saline injected into the left atrium, a curve was obtained which was almost identical with that obtained from dye dilution studies made under corresponding conditions. There was also good correlation between dye and thermal curves recorded simultaneously from the femoral arteries in a patient with a bidirectional shunt through a patent ductus arteriosus. Similarly good correlation was obtained when thermal and dye dilution studies were performed in the operating room before and after the closure of an uncomplicated ostium secundum atrial septal defect.

There are several advantages to the direct intravascular and intracardiac detection of an indicator. Numerous curves may be obtained in a single study without the necessity of blood replacement or anticoagulation. The problems of skin discoloration and

pyrogenic reactions from multiple dye injections are greatly decreased. The instrumentation is relatively simple and the apparatus inexpensive and easy to construct. —*George R. Holswade, M.D.*

Objective Evidence of the State of Acquired Valve Lesions Obtained Without Trauma Before and After Surgery. WILLIAM DOCK. *Ann. Int. M.*, 1960, 53: 936.

IN CONGENITAL HEART DISEASE, when shunts are closed, there is no question of the effectiveness of the procedure. When valvular insufficiency or a stenotic lesion is attacked, it obviously is wise to obtain objective evidence of the resulting change in the circulation to decide whether treatment has been curative, palliative, or ineffective. Ideally, all stenotic or insufficient valves should be studied by simultaneous measurements of pressure gradients and flow volumes, at rest and after exercise, before and after operation. There are a number of less precise but satisfactory objective methods for evaluating these lesions. Evaluation of all of the evidence available from harmless studies is the least a patient deserves before the need for more disturbing tests or for an operation is determined.

According to the author, it is now becoming clear to most internists, as it has been to cardiovascular surgeons for 10 years, that the definitive operation for acquired heart disease has not yet been developed. Even the latest procedures are at best palliative and often ineffective. Since the most experienced groups have devised different techniques for dealing with mitral stenosis, in every case heart sounds and ballistocardiograms should be recorded to serve as a baseline for postoperative evaluation. Had this been done in the thousands of patients with mitral lesions submitted to operation in the last decade, the value and shortcomings of Souttar's operation would have been defined long ago and progress in operations for cardiac lesions would have been far more rapid.

—*Robert A. Nabatoff, M.D.*

Pulmonary Valvular Stenosis (Les sténoses pulmonaires valvulaires). A. BRETON, C. PUPUIS, R. DU BOIS, and R. DUPUIS-BRACQ. *Ann. ped.*, Par., 1960, 36: 509.

IN REPORTING 22 cases of pulmonary valvular stenosis observed during the past 2 years at the Pediatric Medical Division of the University of Lille, France, the authors thoroughly review all the aspects of this congenital condition. The patients' ages ranged between 6 months and 12.5 years. There were 2 cases of pulmonary stenosis associated with interatrial septal defect of the ostium secundum type; 2 cases of pulmonary and infundibular stenosis associated with high interventricular septal defect; and 18 cases of pulmonary stenosis associated with a patent foramen ovale. A more detailed report is concerned with this last group. Cyanosis was present in 8 of the 18 cases but was important in only 2, and appeared in only 1 before the first year of life. Exertional dyspnea was the major symptom, always present and severer with increase in age.

Besides routine roentgenographic examinations, the authors have made cineangiocardiographic studies of the pulmonary artery conus. They show a characteristic violent systolic lifting of its upper anterior portion and a wave of transmission to its lower part. Catheterization data are also reviewed. Venous angiocardiography is of little use and at times dangerous. Selective right ventricular angiocardiography with 1 c. c./kgm. of radioselectan 70 per cent and with the patient in lateral position gives more information with good visualization of the right ventricular cavity and walls, the infundibulum, the valves, and the pulmonary artery. The size of the stenosis also can be judged with good approximation by this means. Of interest also is the selective cineangiocardiography enabling perfect visualization of the cardiovascular dynamics.

The spontaneous evolution of pulmonary stenosis is toward cardiac failure. Complications include infections and, in the case of right to left shunt, cerebral abscess of which there were 2 cases in this series.

Valvotomy is indicated when right ventricular pressure is 70 mm. Hg or more. The intervention should be made early, as the chances of failure increase with age because of the infundibular hypertrophy and right ventricular fibrosis.

An exact judgment of the infundibular size is best obtained only by selective right ventricular angiocardiography. Several excellent angiocardiographic pictures seem to support this statement.

—*Giuliano Di Bartolo, M.D.*

Long Term Results of 450 Mitral Commissurotomies. (Text in Greek). B. KARAGEORGE, I. PAPANIKOLIS, S. KOUREMENOS, N. OECONOMOPOULOS, and Others. *Helliniki Iatriki*, 1960, 29B: 689.

SINCE June 1953 the authors have performed 450 mitral commissurotomies at the Surgical Clinic of the N. Ionia General Hospital in Athens, Greece. There were 16 cases in 1953, 62 in 1954, 56 in 1955, 121 in 1956, 89 in 1957, 66 in 1958, and 40 in 1959. The results were considered excellent or good when the patients were able to return to work after operation. The selection of patients is very important. Operability was usually determined by history, physical examination, roentgenographic and electrocardiographic findings, and in a few difficult cases by hemodynamic studies.

The operation was performed through an anterolateral left thoracotomy and in all but 8 cases the right atrium was entered through the auricular appendage. In the remaining 8 patients the atrial wall itself or the pulmonary vein were the points of entrance. Digital opening of the commissure was possible in the majority and in only 15 per cent of the total number was the commissurotomy completed with the knife.

The ages of the patients ranged from 10 to 60 years but 310 were between 21 and 40 years of age. There were 137 males and 313 females. Most of the patients belonged to groups II and III, 132 and 259 respectively, whereas only 1 was classified as being in group I and 58 were in group IV. Great effort was made to determine the presence and the degree of mitral insufficiency. In 61 instances the predominant lesion was thought to be stenosis. In 10 of these the insufficiency was found at operation to be the main lesion. Arrhythmia was present in 18 per cent of all cases and thrombosed auricular appendages were present in half of them, 9 per cent of the total

number. Postoperative embolic phenomena appeared in 1.8 per cent, all of them occurring in patients with arrhythmia.

The operative mortality was 4.6 per cent or 21 patients. The causes of death included; emboli, 8; pulmonary edema, 4; heart failure, 5; cardiac arrest, 1; hemorrhages, 2; and unknown in 1 with hyperpyrexia. Transient postoperative complications included 18 pleural effusions, 8 hyperpyrexias, 14 arrhythmias, 5 psychoneuroses, 8 postoperative hemorrhages, and 26 rheumatic reactions. The long term results of the surgical treatment were classified as excellent in 65 per cent, good in 10 per cent, fair in 9 per cent, no improvement in 5 per cent, operative mortality 4.6 per cent, and late deaths 5.4 per cent. The physical findings over the heart seldom disappeared even in cases with excellent results. The size of the heart decreased and the electrocardiogram revealed slow improvement in patients with good or excellent results. —*Michael G. Seremetis, M.D.*

Pathologic Anatomy of Aortic Valvular Stenosis (Die pathologische Anatomie der Aortenklappenstenose). KLAUS GOERTTLER. *Thoraxchirurgie*, 1960, 8: 326.

FROM A PATHOGENIC VIEWPOINT congenital aortic stenosis belongs to a group called the "left heart hypoplasia syndrome" which is divided into three subgroups according to the teratogenic determination period. The first subgroup is determined during the fourth to fifth embryonal weeks. The growth of the left ventricle is repressed, thereby preventing the ventral migration of the outflow tract which lies to the right and laterally. This leads to a mislocation of the great vessels. In rare cases the aortic cone can be obliterated by the septum despite dextroposition of the aorta.

The second subgroup of the syndrome occurs after the closing of the ventricular septum between the middle and the end of the first month. The aorta and pulmonary artery are in their normal locations but are sharply bent. Disturbances in growth during this period result in complete hypoplasia of the left side of the heart with an intact ventricular septum, usually accompanied by mitral stenosis and widespread endocardial fibroelastosis. The aortic cone can be completely closed. More discrete is the aortic cone stenosis with or without an aneurysm of the membranous portion of the ventricular septum.

Anomalies of the third subgroup have a better prognosis than those of the first two groups and are of great surgical interest. They occur later and in contrast to the other anomalies are associated with hypertrophy of the left ventricle. This hypertrophy may be a result of the left ventricular hypoplasia. The postnatal circulation with its greatly overloaded left side must adapt itself in a short time or fail. Hearts of infants who die shortly after birth demonstrate, in addition to a small left ventricle, a massive fibroelastosis of the parietal endocardium and an open ductus botalli. In cases in which the child lives, the left ventricle adapts to the increased strain and becomes hypertrophic, and a so-called aortic configuration develops. The deformed valve in congenital stenosis is often the site of an acquired endocarditis. Anomalies in the number of leaflets are not rare. In reviewing autopsy material it was discovered that secondary adhesions of the aortic valve had simulated a bivalve in 75 per cent of the cases.

Because of marked thickening of the valve, surgical treatment is not always successful. Several forms of the anomaly are diagramatically illustrated. These include a jetlike form, a perforated valvular type, and a type with thickening below the valve.

Acquired aortic stenosis occurs mainly in the sixth and seventh decades, and the patient with it lives on the average 15 to 20 years longer than the one with mitral stenosis. Men acquire it four times as often as women. The cause varies with the age at which the deformity is acquired. In the early years it may be secondary to an endocarditis; between the years 20 and 40 the cause may be rheumatic and between the years 40 and 70, arteriosclerotic.

Acquired aortic valvular stenosis is divided into three types according to the pathogenesis: a Moenckeberg type, a rheumatic type, and a Lenta type. The Moenckeberg type is primarily a noninflammatory atherosclerosis of the aorta; one speaks of a valvular sclerosis. Operative therapy is not indicated in this type. The Lenta type represents an acute or subacute bacterial endocarditis. Because bacteria are encased in a resulting calcification, operative intervention is not feasible. The rheumatic type by virtue of strong tissue reaction is in excellent condition to repel any organism. A large percentage of uncalcified and also some calcified aortic stenoses have a rheumatic genesis. Calcification involves the deep portion of the valves as well as the superficial ones. In contrast to the Moenckeberg valvular disease, in more than half of the cases of rheumatic aortic valvular endocarditis other valves are also involved, usually the mitral valve.

The absence of calcium deposits is a favorable indication for valvulotomy. A concurrent mitral disease is a contraindication for valvulotomy, even in a favorably disposed aortic valvular stenosis, unless the two valves are treated at the same time.

—*Andrew P. Adams, M.D.*

The Treatment of Acquired Aortic Stenosis by Valvuloplasty. DONALD G. MULDER, ALBERT A. KATTUS, and WILLIAM P. LONGMIRE, JR. *J. Thorac. Cardiovasc. Surg.*, 1960, 40: 731.

EIGHTEEN PATIENTS with acquired aortic stenosis were treated by the open technique using extracorporeal circulation with a modified disc oxygenator. In addition to the usual clinical feature of aortic stenosis, the authors considered a significant pressure gradient across the aortic valve as essential in the selection of patients for operation. In all but 1 patient, who had a low cardiac output, this gradient was 50 mm. of Hg or greater.

The aortic valve was approached through a median sternotomy and a hockey-stick aortotomy. Ischemic arrest was used in the first 11 patients, but in the remainder selective cardiac hypothermia was achieved by coronary perfusion with cold oxygenated blood. The authors emphasize that commissurotomy is not enough and that removal of as much of the calcium deposits as possible and mobilization of the leaflets by valvuloplasty is necessary to successfully reduce the gradient across the valve. A technique for removal of

the calcium is described in which an incision is made through the base or annulus side of the deposit and an endarterectomy elevator is used to establish the proper cleavage plane, working toward the margin of the cusp.

There were 4 operative deaths, 2 of which were caused by calcific emboli to the coronary arteries either during or immediately after the operation. Two deaths were caused by severe central nervous system damage. One patient died 7 months after operation of bacterial endocarditis. The average postoperative pressure gradient across the aortic valve in the 13 survivors was 5 mm. Hg and all showed symptomatic improvement.

—George R. Holswade, M.D.

Differential Cardiac Hypothermia for Elective Cardioplegia. HAROLD C. URSCHEL, JR., and JACK J. GREENBERG. *Ann. Surg.*, 1960, 152: 845.

IT WAS THE PURPOSE of this investigation to evaluate the safety and effectiveness of differential hypothermic cardioplegia for prolonged intracardiac procedures.

Two techniques for the production and maintenance of differential hypothermic cardioplegia have been developed. One was designed to expedite the surgical approach to aortic valvular lesions and the second to be utilized for other open cardiac procedures. A cardiopulmonary bypass circuit was employed to perfuse the body at mild hypothermic levels of 30 degrees C. during the deep hypothermic cardiac arrest. The circuit consisted of a piston pump and a modified rotating disc oxygenator.

Fifty-two experiments utilizing differential cardiac hypothermia were performed. Cardiac arrest was maintained for varying intervals. The range extended from 15 to 120 minutes. Rapid differential hypothermia effects cardioplegia below 16 degrees C. and protects the heart from hypoxia. The safety of this method of elective cardiac arrest is substantiated by the survival of 85 per cent of the experimental series for over 48 hours.

Histologic examination of the hearts and lungs of the experimental animals disclosed no significant tissue damage. Quinidine gluconate did not reduce the high incidence of ventricular fibrillation.

Application of differential hypothermic cardioplegia has been accomplished in 10 clinical patients. A comparison series of potassium citrate cardioplegias in 10 animals demonstrated the advantages of differential cardiac hypothermia for elective arrest. Clinical application of differential hypothermic cardioplegia has been extremely satisfactory and it represents a marked improvement over other methods currently used. *—Robert A. Nabatoff, M.D.*

Open Heart Surgery Using Deep Hypothermia Without an Oxygenator. ARCHER S. GORDON, BERTRAND W. MEYER, and JOHN C. JONES. *J. Thorac. Cardiovasc. Surg.*, 1960, 40: 787.

THE AUTHORS DESCRIBE their experience with open heart surgery using deep hypothermia without an oxygenator in animals and 27 patients. A single heat exchanger is used to cool patients weighing up to 80 pounds, and a double heat exchanger is used for patients over this weight.

Essentially, each ventricle is bypassed through a pump circuit, the patient's lungs being utilized to oxygenate the blood. When the desired temperature is reached, any of the intracardiac cannulas may be withdrawn and the defect may be repaired since the circulation is arrested either because of fine fibrillation or hypothermia. With completion of the repair, the cannulas are replaced and rewarming is begun.

The authors studied the duration of circulatory arrest as related to body temperature in 10 dogs. This work was based on the hypothesis that each 50 per cent reduction in oxygen consumption doubles the safe period for circulatory arrest. They found that dogs cooled to 10 degrees C. and subjected to 60 minutes of total circulatory arrest made complete recoveries. This has also proved true in the authors' clinical experience.

It is pointed out that an upward temperature drift of 5 to 6 degrees an hour occurs and that this must be taken into consideration in calculating the desired temperature to attain the anticipated duration of circulatory arrest.

Of the 27 patients operated upon, 7 died. One death was caused by a technical error, 1 to aspiration of food in the postoperative period, and 1 to complete heart block. The remaining 4 deaths occurred in patients with tetralogy of Fallot in addition to other defects.

Other physiologic measurements included the following: (1) In monitoring temperatures, it was found that the esophageal temperature most closely paralleled that of the brain. (2) In all but 3 cases ventricular fibrillation occurred, usually at below 18 degrees C., and the lower the temperature the finer the fibrillation. The process reversed on rewarming and usually only one shock was necessary for defibrillation. (3) Preoperative and postoperative electroencephalograms were normal, but during the procedure the electroencephalogram was flat. (4) By 2 hours after operation all metabolic measurements were returning to normal; no patient required alkaline medication.

The authors conclude that deep hypothermia has the 3 advantages of (1) mechanical simplicity; (2) reduced blood volume—only 1,000 c.c. of priming volume; and (3) an ideal operative field, since the circulation is arrested. *—Richard E. Gardner, M.D.*

The Response of the Serum Glutamic Oxalacetic Transaminase to Open Heart Operation. HANS BAER and S. GILBERT BLOUNT, JR. *Am. Heart J.*, 1960, 60: 867.

THE LEVELS of serum glutamic oxalacetic transaminase, SGOT, were studied before and after a variety of cardiovascular operations. Within a group of 27 patients who underwent intracardiac operations under the conditions of cardiopulmonary bypass there was no significant difference among the three subdivisions, namely, tetralogy of Fallot, ventriculotomy alone, and auriculotomy alone. However, the SGOT reached significantly higher levels in 7 patients who expired in the immediate postoperative period than in those who survived. There was a marked difference between the peak elevation in patients perfused more than 40 minutes and the peak elevation of those perfused less than 40 minutes. A significant difference also existed between this group of 27 patients operated on with ex-

tracorporeal circulation and 16 patients who underwent procedures without circulatory bypass.

The authors conclude that the levels of SGOT, and probably enzymes in general, cannot be considered as an index of tissue damage alone in patients who have undergone cardiac operations, but rather as a part of a complex response of the whole organism.

—George R. Holswade, M.D.

ESOPHAGUS AND MEDIASTINUM

Early Esophagoscopy for Diagnosis of Esophageal Burns. JULES KAPLAN, KISHEN GANDHI, JOHN ELSEN, and PETER OPPENHEIMER. *Arch. Otolar.*, Chic., 1961, 73: 52.

THERE ARE only two sure methods, the authors state, of determining in which patients who ingest corrosive chemical substances esophageal stricture will develop. These are early esophagoscopy and waiting for stricture formation. It is important, if unnecessary bougie or steroid therapy is to be avoided, that early diagnosis of those who are potential stricture formers be determined. The specific regimen set up by the Department of Otorhinolaryngology at the Cook County Hospital in Chicago, Illinois is listed under both the immediate therapy, such as olive oil and milk by mouth, and antibiotics, steroids being withheld. On the diagnostic side the esophagoscopy is postponed until 5 or 7 days after the ingestion of the corrosive material. If a burn is discovered on esophagoscopy, bougie regimen is begun; if no burn is seen the patient is re-evaluated in 6 weeks.

In a 10 month period the authors have encountered 75 cases of ingestion of corrosive chemical substances. Seventy of these 75 had visible burns of the lip, mouth, or pharynx. Twenty-one of the 75 cases or 28 per cent had esophageal burns so that 72 per cent were spared prolonged, needless therapy. There were no complications of the esophagoscopy.

—Ward D. O'Sullivan, M.D.

Achalasia of the Esophagus in Children. ORVAR SWENSON and CHRIS T. OECONOMOPOULOS. *J. Thorac. Cardiovasc. Surg.*, 1961, 41: 49.

ACHALASIA OR MEGAESOPHAGUS is a disorder of the emptying mechanism of the lower esophageal segment which is apparently due to a failure of sphincter relaxation. Achalasia is rare in children, constituting 4 per cent of the cases in all age groups. Weight loss, dysphagia, regurgitation, and aspiration with pulmonary complications dominated the clinical histories, and in contrast to achalasia seen in adults, pain was not a common complaint. The characteristic roentgenographic finding was a smooth narrowing at the cardia with dilatation which was greatest in the lower half of the esophagus.

The most satisfactory results were obtained with instrumental dilatation of the esophagus and this treatment was performed on all patients by the authors. Surgical intervention is the treatment of choice in approximately 20 per cent of children and the Heller operation seems to be the best for the mild and moderate degree of achalasia and the Wendel operation for the advanced cases. In the Heller operation the muscular coat is incised and the mucosa remains intact. In the Wendel procedure the mucosa as well as the muscular coat is opened and the incision closed in the opposite plane. The authors present results obtained in 6 cases. Strip biopsies were taken from the lower esophagus in 2 patients and no ganglion cells were noted. Similar strips of tissue were removed from normal esophagi at postmortem examination and these contained numerous ganglion cells. Pathologic studies in adults have been made by several investigators and a degenerative lesion of Auerbach's plexus of the lower esophagus has been demonstrated. It is postulated that in children the defect is the same except that the lesion is congenital in origin.

—Gordon F. Madding, M.D.

Retrosternal Colon Transplant for Resected Esophagus (Contributo al trattamento chirurgico delle stenosi esofagee da caustici mediante esofagoplastica con il colon destro per tunnellizzazione retrosternale). R. NICOLO' and F. FALCO RAUCCI. *Cardarelli*, 1960, 2: 85.

THE AUTHORS REPORT the cases of 3 patients operated upon for stenosis of the esophagus at the United Hospitals of Naples, Italy. The right half of the colon was substituted for the resected esophagus. The 3 cases resulted from swallowing of caustic soda and required anastomosis in the cervical region because of multiple stenotic areas.

The colon was transplanted in the substernal region and an anastomosis was accomplished in the cervical region and with the stomach. Two of the patients died soon after operation and 1 survived and had a good result. Their ages were 16, 20, and 26 years.

A review of the literature is presented and the pros and cons of the method are discussed. The authors have had experience in using jejunal and stomach transplants but believe that this new approach using the right half of the colon in a retrosternal position is a much simpler and better way of accomplishing a functioning substitute for the resected esophagus.

—Lucian J. Fronduti, M.D.

The Diagnosis of Mediastinal Lymphoma by Thoracotomy. JOHN T. GOSWITZ and KARL P. KLASSEN. *Dis. Chest*, 1960, 38: 581.

THE DIAGNOSIS of isolated lymphadenopathy presenting as single or multiple tumors of the mediastinum may be very difficult. In a 10 year period, there were 1,652 admissions of patients with lymphomas. In 20 patients a specific diagnosis of mediastinal adenopathy was not established by the accepted diagnostic procedures and, rather than subject these patients to diagnostic roentgen therapy, exploratory thoracotomy was used to obtain tissue for a correct diagnosis.

These explorations were made through a small either anterior or posterior thoracotomy. Specific lymphomas were found in 7 patients and benign disease was discovered in 13 patients.

The indications, techniques, and advantages of the small anterior thoracotomy are discussed. Certainly the advantages offered by direct biopsy with an accurate diagnosis cannot be denied in this group of patients, and thoracotomy should be resorted to promptly if tissue can not be obtained by other means.

—Thomas W. Shields, M.D.

DIAPHRAGM

Penetrating Wounds of the Diaphragm. FRED J. WOLMA, JR., and JEFF R. MOORE. *Surgery*, 1960, 47: 728.

PENETRATING WOUNDS of the diaphragm are the most frequent cause of traumatic diaphragmatic hernias. Even trivial lacerations possess the potential for developing into serious and complicated surgical problems. The mechanism of development of a large hernia from a stab wound is related to the differential in pressure in the pleural and abdominal cavities. An original small herniation of omentum may progress to a hernia containing portions of one or more of the abdominal viscera.

The authors report that in a 10 year period 17 patients with traumatic diaphragmatic hernias were seen. Six resulted from stab wounds of the chest and one from a gun shot wound. In the same period 24 patients with acute penetrating wounds of the diaphragm were operated upon and the defect was repaired. Three patients with complicated traumatic hernias from stab wounds are reported in detail.

It is concluded that stab wounds of the chest below the level of the seventh rib in the midaxillary line demand laparotomy for repair of possible injury to abdominal viscera and possible laceration of the diaphragm to prevent the later development of a diaphragmatic hernia. It is further suggested that all such hernias, when discovered, should be repaired whether symptomatic or not, if the general condition of the patient permits such repairs.

—Thomas W. Shields, M.D.

Hiatal Hernia Repair. WALTER HARVEY JACOBS and IVAN D. BARONOFSKY. *Am. J. Digest. Dis.*, 1960, 5: 1039.

A REVIEW of the subject of treatment of hiatal hernia by the authors leads them to conclude that hiatal hernia repair is indicated for those patients whose symptoms are without question due to hiatal hernia and who are intractable to medical therapy. Esophagitis and its complications of stricture and hemorrhage are not necessarily indications for operation, but the presence of esophagitis is more indicative of probable medical intractability than is the presence of symptomatic hiatal hernia without associated esophagitis.

In a detailed study of changes in symptoms of 16 patients who underwent surgical treatment of hiatal hernia, it was found that the symptoms that appear to be improved were heartburn, substernal pain, substernal pressure, vomiting, regurgitation, dysphagia, odynophagia, and manifestations of bleeding. The symptoms that were not benefited, on the other hand, included epigastric pain, nausea, bloating, and eructation. New symptoms or untoward effects from the operation included postoperative dysphagia of short duration, postthoracotomy pain, and the inability to induce eructation when feeling bloated.

The patients who were most satisfied with the procedure included those who preoperatively had had proved esophagitis, intractable heartburn without proved esophagitis, and substernal pain or epigastric pain. The patients who were most dissatisfied with the procedure included those with the mildest symptoms preoperatively.

—James H. Holman, M.D.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL, PERITONEUM, AND HERNIA

Subcutaneous Emphysema: An Important Sign of Intra-Abdominal Abscess. LeRoy H. Stahlgren and George Thabit, Jr. *Ann. Surg.*, 1961, 153: 126.

Abdominal wall crepitus from retroperitoneal gas and discoloration caused by blood diffused from the retroperitoneal space represent important physical findings. Similarly, subcutaneous emphysema should be recognized as a sign of intra-abdominal abscess containing gas-forming bacteria.

The clinical association of palpable subcutaneous gas and intra-abdominal abscess probably occurs more commonly than is appreciated. It is more likely to occur in older patients in whom far advanced infection may exist with minimal clinical signs and in whom resistance to infection is impaired. Weight loss with decreased tissue tension may influence the diffusion of gas.

The gas which is elaborated by bacteria in an intraperitoneal abscess probably gains access to the retroperitoneal tissues through the surrounding peritoneum which becomes inflamed and necrotic. In other patients, the infection may already be retroperitoneal.

The exact route which retroperitoneal gas follows to the superficial tissues of the abdominal wall has been difficult to trace. The possible routes of such diffusion are discussed.

More complete bacteriologic studies are necessary to identify the organisms commonly involved in the production of gas in patients in whom subcutaneous emphysema develops. Bacterial symbiosis probably plays a role. —*Ely Elliott Lazarus, M.D.*

A Technique of Vertical Repair of Big Umbilical Hernia. M. A. Hassab. *Alexandria M. J.*, 1960, 6: 484.

It is the author's contention that recurrence is common after repair of large umbilical hernias by means of the Mayo technique. He believes this is true because there is weakness at the gap between the mattress sutures and the lateral ends of the wound where the overlap of the flaps is minimal. In addition, no provision is made for reinforcement of the linea alba, which is always widely stretched and lax in obese patients with large umbilical hernias.

The author employs the technique utilizing vertical elliptic incisions with closure of the peritoneum vertically by means of continuous catgut suture. The aperture in the linea alba is also closed vertically with continuous sutures of stainless steel wire. The stretched linea alba is then inverted by a series of continuous sutures of stainless steel both below and above the hernial aperture until the two rectus muscles are approximated. Gastric suction and intestinal stimulants are continued for 3 to 4 days postoperatively to avoid distention and the patient is kept in bed for 8 to 10 days.

Thirty-seven cases have been followed up for periods varying from a few months to more than 5 years with no recurrences. The operative cases included many recurrences after Mayo's repair and the author believes that a temporary ridge or keel is produced by the inversion of the linea alba and that abdominal pressure helps to fuse it with the posterior aspect of the linea alba and recti giving it more strength.

—*James H. Holman, M.D.*

Adnexohernia in Childhood (Die Adnexohernie im Kindesalter). R. Rauhs. *Wien. med. Wschr.*, 1960, 110: 426.

The first records of adnexohernia are found in a book by Soranos, a Greek physician of Ephesus in the second century. Paulus Aeginetta in the seventh century found ovaries in the hernias of little girls. Between 1866 and 1899, the English Truss Society reported 147 cases of ovarian hernia, 115 of them in patients under 1 year of age. The majority of all inguinal hernias in infancy and early childhood are congenital. Sex distribution is overwhelmingly in favor of the male, 85 per cent. Direct hernias in childhood are rare, 1 per cent, according to Coles. Fischer found 2 adnexohernias among 300 hernia patients.

The inguinal hernia sac of the female may contain: tumors and cysts of the round ligament; varicosities; any of the sections of the gut, i.e., Meckel's diverticula; uterine tumors or pregnancies; tubes and their tumors, pregnancies, and inflammation, i.e., tuberculosis; ovaries and their tumors; urinary bladders; and omentum. The adnexa may be normal or affected by malignancy. Adnexohernias may be reducible or irreducible, with torsion or incarcerations.

Most adnexohernias are found in the inguinal variety of hernia, with the femoral in second place. Obturatorian and sciatic locations, as well as adnexohernias in vaginal prolapse into the cul-de-sac and vesicouterine space, are described.

The author gives a summary of the symptomatology and a review of the embryology concerned with this problem. Also described is the coexistence of adnexohernia with hermaphroditism and monstrosity.

Since spontaneous corrections are known to occur, expectant treatment is the choice in the first year of life. If the adnexohernia is irreducible or the patient older than a year, operation is chosen. High amputation of the hernial sac is carried out without splitting of the aponeurosis. It is very seldom necessary to remove an ovary unless disease is present. Recurrences are less than 1 per cent in childhood.

—*Otto Weiss, M.D.*

Observations on the Etiology of Spigelian Hernia. Raymond C. Read. *Ann. Surg.*, 1960, 152: 1004.

The author reports 8 cases of spigelian hernia proved at operation and points out that they typically occur in the older age group and arise spontaneously. A preponderance of individuals who have lost weight from dieting or disease was noted in the series.

The cause of the condition is discussed and the author's experience leads him to believe that deterioration in the strength of the inner layers of the abdominal wall in this region leads to the extrusion of the extraperitoneal fat which may then be followed by peritoneum with or without visceral contents. It is noted that this theory is in general agreement with that of Bailey and Zimmerman and his colleagues.

—*C. Thomas Fitts, M.D.*

Comparison of Intestinal Anastomosis in One Layer and in Two Layers (Valeur comparée des sutures intestinales en un plan et en deux plans). R. BUCHIN and J. VAN GEERTRUYDEN. *Acta chir. belg.*, 1960, 59: 461.

THE AUTHORS PERFORMED 49 intestinal anastomoses in dogs, 30 in one layer, and 19 in two layers. The postoperative course was identical in both groups, but microscopic examination of the anastomoses revealed that during the first 10 days the single layer showed less inflammatory reaction and an absence of mucosal abscesses.

In a clinical study of 437 intestinal anastomoses performed at Brugmann Hospital, Brussels, Belgium the early postoperative course was more favorable in 133 cases with a single layer anastomosis, as compared with 304 patients with a double layer, when percentages of ileus, fistula formation, leakage, and death were computed. However, late complications, such as stenosis and inflammatory reaction, occurred with equal frequency in both groups. The authors favor a single layer anastomosis on the basis of their experimental and clinical findings.

—*John H. Wulsin, M.D.*

GASTROINTESTINAL TRACT

Prognosis of the Medically Treated Small Gastric Ulcer. NORMAN E. LARSON, JAMES C. CAIN, and LLOYD G. BARTHOLOMEW. *N. England J.M.*, 1961, 264: 119.

FOLLOW-UP INFORMATION was obtained for 5 to 11 years after the start of medical treatment in 664 patients with small, benign-appearing gastric ulcer. The results of medical therapy were discouraging. Only 21.7 per cent of the 664 patients reported symptomatic relief with complete and permanent healing, a percentage that did not vary greatly between series. Despite more careful selection of patients in the second series, the distribution of patients who abandoned medical management for surgical treatment was greater in this series—45.8 per cent as compared to 33.9 per cent in the first series.

Regarding the cases in which medical management failed, a gastric neoplasm was found in 24.3 per cent of 140 operations in the first and in 11.3 per cent of 115 operations in the second series. Nine of the 10 inoperable patients were in the first series. The overall incidence of patients with a gastric cancer was 8.9 per cent. The incidence was 10.4 per cent in the first and 6.4 per cent in the second series.

From these data it appears that, with the use of more rigid criteria in the initial selection of patients for medical management and with earlier surgical intervention in a higher percentage of patients in whom medical management is unsuccessful, the incidence of some of the complications of gastric ulcer can be significantly decreased.

Gastroduodenal Ulcer in the Adolescent (L'ulcera gastroduodenale nell'adolescenza). B. AULISA and F. MACONI. *Riforma med.*, 1960, 74: 1281.

THE AUTHORS report 8 cases of gastroduodenal ulcer observed at the Surgical Clinic of the University of Pavia, Italy, in adolescents varying in age from 13 to 20 years. These cases were observed in the 10 year period, 1950 to 1960.

It is pointed out that whereas ulcers do not occur as frequently in the adolescent as in the adult their occurrence is not rare. Moreover, if the histories of adults are carefully evaluated it will be seen that a number of them began to have symptoms before they were 20 years of age, demonstrating that ulcer in the adolescent is more frequent than is generally believed. The reasons given for a lower incidence in the adolescent are that the diet is usually less irritating, there is usually abstinence from alcohol and tobacco, and there is a minor degree of gastric acidity. Heredity plays an important factor. Four of the 8 patients had a family history of ulcer disease.

Most of the patients were in a poor state of health and only 2 were considered in an optimum state. Hemorrhage occurred in 3 of the patients varying from one to multiple episodes. There were 2 perforations, 1 occurring 3 months after symptoms first began and 1 after 15 days.

The authors believe that operation is the treatment of choice although they point out that many investigators believe that the therapy should be strictly medical except for complications. All of the 8 patients were operated upon and a Reichel-Polya type of gastric resection was performed in the elective cases. Of the 2 patients with perforation a single closure was performed upon the one who was in poor condition at the time of operation, whereas the regular gastric resection was carried out upon the second patient. All patients had good results as noted by follow-up studies. Only 1 patient, the one with simple closure of the perforation, failed to show up for follow-up studies.

—*Lucian J. Fronduti, M.D.*

Volvulus and Torsion of the Stomach (Volvolo e torsione gastrica). G. MAZZOLENI. *Arch. ital. mal. app. diger.*, 1960, 27: 274.

THIS ARTICLE is a report on a small series of patients with different types of gastric torsion, observed at the Department of Radiology of the University of Pavia Medical School, Pavia, Italy. The series includes 1 case of acute volvulus and 4 cases of subacute torsion of the stomach.

The first condition was observed in a man of 70 years of age, admitted as an emergency case with a picture of acute abdomen. Roentgenologic examination of the stomach revealed the presence of a partial volvulus with complete pyloric obstruction. The volvulus was along the longitudinal axis of the stomach. An emergency laparotomy was performed and, although no other pathologic condition than the volvulus was present, a subtotal gastrectomy was performed in order to avoid recurrences.

The remaining 4 cases were instances of subacute torsion of the stomach with no obstruction and long-lasting symptoms. In all cases the patients gave history of gastric pain, prolonged digestion, nausea, and vomiting. A correct diagnosis was achieved with barium meals which revealed the presence of torsion of the stomach. In 1 case the condition was obviously related to a large disruption of the diaphragm due to previous chest trauma. The patient underwent an operation and made a complete recovery. The remaining 3 patients were treated with conservative management, since operation was refused.

In concluding the article, the author emphasizes the need for a prompt roentgenologic study of the stomach including a barium meal. This is mandatory in case of acute onset of the symptoms and whenever signs of obstruction are present.

—Riccardo Benvenuto, M.D.

Value of Aspiration Biopsy of the Stomach in the Diagnosis of Carcinoma (Welchen Wert hat die Saugbiopsie des Magens bei der Karzinomdiagnose?). A. MAHLO. *Fortsch. Röntgenstrahl.*, 1960, 93: 194.

THE ASPIRATION BIOPSY of the stomach not only serves to augment roentgenologic and gastroscopic studies but is also useful in differentiating ulcerative from malignant processes. In the present study carcinoma constituted 4 per cent of all gastric disorders. In the 1,200 patients studied, over 3,000 histologic sections of the superficial gastric mucosa were studied; and in only 2 cases was a submucosal carcinoma diagnosed when roentgenologic studies had failed to do so.

The technique consists of introducing the biopsy tube into the empty stomach and aspirating in the prepyloric and corpus areas, followed by a barium swallow in which the relief changes are studied. If a suspected area is located, the tube is placed on it by means of external pressure and a new sample of mucosa is aspirated. This method permits aspiration of the mucosa even in the contrast-filled stomach. It was found that only superficial mucosa could be aspirated from large craters. These samples usually did not allow a diagnosis of carcinomatous changes when examined histologically. It is often not possible to advance the biopsy capsule beyond the crater, and consequently roentgenology is superior to biopsy in cases of advanced carcinomas.

In 500 cases teased preparations were stained with the May-Giremsa stain and cytologic studies were conducted. In some cases these studies were more helpful than the histologic studies.

The author stresses the fact that the number of patients suspected of having a carcinoma is much larger than the number in which a carcinoma is recognized. Numerous photomicrographs are included in the article.

—Andrew P. Adams, M.D.

An Appraisal of the End Results of Treatment in Carcinoma of the Stomach. WILLIAM F. LIPP and JAMES F. PHILLIPS. *J. Am. M. Ass.*, 1960, 174: 1683.

THROUGH THE FACILITIES of the Tumor Clinic of the Buffalo General Hospital, Buffalo, New York the authors evaluated the end results in the treatment of patients with carcinoma of the stomach. The total number of patients encountered was 611, and the number of patients alive at the end of 5 years without evidence of disease was 27, representing an absolute 5 year survivorship of 4.4 per cent. The authors then proceeded to compare this discouraging figure with the more encouraging results reported in the literature. They indulge in an extensive criticism of methods of reporting results and earnestly suggest that investigators presenting end results in the treatment of this entity follow the rules suggested by the Committees of the American College of Surgeons, the College of American Pathologists, the American College of Radiology, and the American Cancer Society. Investigators who report results and qualify the type of case by resectability, operability, or palliative resections, becloud the over-all issue.

The authors analyzed 18 series of cases reported in the American literature from 1947 to 1955. They adjusted the figures to fulfill their criterion of absolute survivorship after the diagnosis, resulting in an absolute 5 year survivorship of 7.1 per cent. The conclusion is then drawn that the results in their own series and in the general American literature are very discouraging and that a significant improvement in therapeutic accomplishment is not likely through the use of present methods of diagnosis and treatment. Their hope is that ultimately the successful control of gastric carcinoma will result from the application of biochemical methods in diagnosis and treatment.

—Ward D. O'Sullivan, M.D.

Gastrectomy and the Blind Loop Syndrome. V. J. KINSELLA and W. B. HENNESSY. *Lancet*, Lond., 1960, 2: 1205.

THE AUTHORS PRESENT the cases of 7 patients who had symptoms after gastrectomy for duodenal ulcer and in whom there was roentgenographically demonstrable stasis in the afferent jejunal loop. They also reviewed the various known difficulties and effects of performance of gastroenterostomy, gastrectomy, and vagotomy.

From an analysis of these various symptoms and facts they conclude that many of the symptoms which follow gastrectomy for ulcer are related to the technical performance of the operation. It is their belief that any stasis in a given loop of intestine should be avoided. This is of far greater significance than is any rapid emptying as a disease factor.

—Robert W. Williams, M.D.

The Dumping Syndrome; Clinical and Radiological Aspects. H. T. COX and W. R. ALLAN. *Lancet*, Lond., 1960, 2: 1261.

SYMPTOMS of dumping after subtotal gastrectomy may be brought on by eating certain foods such as milk, milk puddings, eggs, various fatty foods, chocolates, and pastries. Similar symptoms may be produced in the gastrectomized patient experimentally by feeding the individual a 50 per cent glucose solution. The outstanding symptoms associated with dumping are profound weakness and a feeling of lightheadedness. In a severe attack an individual may be totally incapacitated. Walking about, particularly in a warm atmosphere, and taking of foods that are hot increases the severity of the usual attack of dumping.

Using a 50 per cent glucose solution to produce the symptoms of dumping, several investigators have described increased motor activity in the jejunum and signs of increased fluid in the gut. The question raised by the authors is whether the cause of the symptoms produced by ingesting 50 per cent glucose is the same as the mechanism which produces natural dumping induced by the ingestion of certain normal foods. The authors have demonstrated to their own satisfaction both clinically and roentgenologically in 15 patients that after the ingestion of certain normal foods usually associated with the production of a dumping attack, there is stasis, dilatation, and no peristalsis whatsoever in the gastric remnant, duodenum, and jejunum during the natural dumping episode. They were also unable to demonstrate that there is an increased amount of fluid in the gut under these circumstances. The fact that these findings stand so opposed to the previously demonstrated hypermotility and increased fluid accumulation suggests to the authors that natural dumping associated with ingestion of various normal foods is probably different in cause and mechanism than the artificial dumping syndrome produced by the ingestion of a 50 per cent glucose solution.

—*Harvey N. Lippman, M.D.*

Surgical Treatment of Postgastrectomy Symptoms. E. Amdrup. *Acta chir. scand.*, 1960, 120: 151.

A PLASTIC PROCEDURE to narrow the gastrojejunal stoma was effective in relieving 32 of 44 patients with severe dumping syndrome symptoms after Billroth II gastric resections. The operation consisted of a transverse incision at the anastomosis, followed by longitudinal closure, attempting to produce a stoma which would just admit the thumb. All patients had been severely handicapped by their symptoms and those considered significantly improved were able to resume normal activities, though some still required some dietary regulation. Transforming a Billroth II anastomosis to a Billroth I is also a satisfactory method of relieving the dumping syndrome.

Characteristic anatomic changes were present at reoperation in patients with severe dumping symptoms. The stoma had enlarged and the efferent loop of small bowel had dilated into a large funnel-shaped contour for a distance of 30 to 100 cm. from the stoma. The afferent loop was unchanged.

The same plastic procedure was performed on 7 patients with chronic symptoms referable to the small intestine and on 5 patients with symptoms attributed to small stomach without relief in any of them.

—*Stanley W. Tuell, M.D.*

Absorption Studies After the Insertion of Colon as a Substitute for Both the Stomach and the Esophagus. V. O. Björk and B. Norberg. *Ann. Surg.*, 1960, 152: 1049.

THE AUTHORS describe the successful replacement of the esophagus with a segment of the right half of the colon after esophageal resection for recurrence of an adenocarcinoma 2 years after total gastrectomy. Since the colonic segment showed a good food reservoir function in the recumbent position, absorption and secretion studies were conducted. The methods and materials used for studying the absorption of alcohol, glucose, glycine, xylose, vitamin A, and cyanocobalamine, and the excretion of calcium and iron are detailed. The findings indicated good absorptive quality of colonic mucosa for alcohol, glucose, glycine, and xylose. Vitamin A absorption was less pronounced and cyanocobalamine was not absorbed at all. The excretory function for calcium was good and that for iron poor. These results agree with those of previous investigators. —*C. Thomas Fitts, M.D.*

The Etiology of the True Megaduodenum (Zur Aetiologie des "echten" Megaduodenums). W. Sehmisch. *Zbl. Chir.*, Leipzig, 1960, 85: 1824.

IN A 16 YEAR OLD BOY complaining of chronic vomiting, abdominal distention, and lack of growth a megaduodenum was diagnosed roentgenographically. On roentgenographic examination the duodenum filled with the barium contrast material, enlarging at first and subsequently emptying by way of a large communication into the jejunum. The patient was cured by a duodenojejunostomy, gained weight, and had no further difficulty thereafter. A roentgenographic examination 12 years later revealed only slight duodenal enlargement.

The author views the true megaduodenum as a secondary consequence to congenital maldevelopment of the duodenum. —*Karel B. Absolon, M.D.*

Primary Carcinoma of the Duodenum (Il carcinoma primitivo del duodeno). P. Faraco, M. Smareglia, and A. Bianco. *Gior. ital. chir.*, 1960, 16: 251.

THE AUTHORS report 4 cases of primary carcinoma of the duodenum observed at the Surgical Clinic of the University of Rome, Rome, Italy. In the past 12 years a total of 8 cases of malignant epithelial tumors involving the small bowel were observed and 4 of these involved the duodenum. The ages of the patients varied from 47 to 57 years of age.

All 4 patients were operated upon but only palliative surgery was possible because the lesions had spread to the regional lymph nodes.

The authors have reviewed the literature on the subject. Diagnosis is considered very difficult since there are no characteristic symptoms or roentgenographic findings. Only a small percentage of the cases prove to be operable with a prospect of cure because of the rapid spread to the regional lymph nodes. The operation of choice for tumors involving the fixed portion of the duodenum is duodenopancreatectomy. Segmental duodenectomy without excision of the pancreas is recommended for tumors involving the mobile portion of the duodenum: the bulb, the third portion, and especially the duodenojejunal angle.

—*Lucian J. Fronduti, M.D.*

General Hypothermia for Managing Gastrointestinal Hemorrhage. George F. Gowen and W. W. Lindenmuth. *J. Am. M. Ass.*, 1961, 175: 29.

TOTAL BODY HYPOTHERMIA was used at the Veterans Administration Hospital in West Haven, Connecticut on 3 patients with massive gastrointestinal bleeding. The exact site of bleeding was unknown in 2 patients and in the 3 bleeding from a plicated postbulbar duodenal ulcer was suspected. These patients re-

ceived 62, 33, and 14 pints of blood, respectively, prior to hypothermia.

Hypothermia was induced with ice bags to both inguinal and axillary areas. Chlorothiazide, promethazine, and barbiturates were used to control shivering. Body temperature was continuously monitored with a thermistor placed in the rectum or esophagus. When the desired temperature of 31 degrees C. (87.8° F.) was reached only one ice bag was usually necessary. It was possible to maintain this body temperature for 4 days by this simple method. By use of this method, bleeding was controlled. Rewarming should begin 24 hours after bleeding has stopped. On the basis of this experience the authors conclude that this method merits further clinical use on poor risk patients with massive gastrointestinal hemorrhage.

—John H. Hudock, M.D.

Selective Surgery for Gastroduodenal Hemorrhage. David J. Tibbs. *Brit. M. J.*, 1960, 2: 1346.

The author reports on a series of 67 consecutive patients in whom operation was performed for acute gastroduodenal hemorrhage. These patients were seen and treated at the Royal Victoria Infirmary, Newcastle upon Tyne, England, between 1953 and 1957. They were selected for operation according to the following criteria: (1) They had already required 6 bottles or more than this 3,240 c.c. of transfused blood to maintain a reasonable circulatory state and (2) they showed evidence of continued or renewed hemorrhage, as judged by pulse rate, blood pressure, and the presence of hematemesis.

Arrangements were made for an emergency operation to begin 1.5 hours after the decision to operate was made. During this interval, blood was given at the rate of one bottle every 20 to 30 minutes until the following requirements were met: (1) the pulse rate was brought to less than 100 per minute, (2) the blood pressure was restored to at least 110 mm. Hg systolic and at least 75 mm. Hg diastolic, and (3) good color was restored to the hands. If the patient failed to improve, it was considered that the hemorrhage was outpacing transfusion, and operation was undertaken without delay.

The rate of complications was higher than that found in patients who have had gastrectomy for uncomplicated peptic ulcer. Similarly, the cure rate for the original condition which caused the hemorrhage was slightly less than that obtained after an elective operation for uncomplicated peptic ulceration. An over-all mortality rate of 3 per cent was found for a group of 392 patients admitted for gastroduodenal hemorrhage and treated either medically or surgically according to the criteria given. The operative mortality rate was 16 per cent for the 67 surgical patients. *—Stephen W. Carveth, M.D.*

Fatal Gastrointestinal Bleeding. Marcel Patterson, Sol Forman, Kenneth Weeden, and Eli Zonana. *J. Am. M. Ass.*, 1961, 175: 19.

The authors studied 110 cases of fatal gastrointestinal bleeding seen in all three Galveston, Texas hospitals, between 1953 and 1957. In 80 of these, the site of hemorrhage was determined by either autopsy or operation. There were 71 males and 39 females in this group. Most of the deaths occurred in the month of October and in patients in the eighth decade of life. Clinical diagnosis was compared with autopsy findings. The physician made the diagnosis of bleeding peptic ulcer, esophageal varices, and malignant lesion of the gastrointestinal tract with almost equal frequency, whereas at autopsy, duodenal ulcer was the cause in 43 per cent of the cases, cirrhosis with bleeding esophageal varices in 23 per cent, and malignant disease in 13 per cent. The over-all accuracy of the clinical diagnosis was 60 per cent and in peptic ulcer this accuracy was only 41 per cent. Sixty-nine per cent of these patients also had a complicating medical illness which contributed to the over-all mortality.

Errors in diagnosis occurred because of (1) failure to consider stress ulcer; (2) failure to look for and consider other bleeding sites in patients with cirrhosis or blood dyscrasias; (3) failure to consider acute hemorrhagic gastritis; and (4) assuming that bleeding in the elderly was due to malignant lesions and interpretation of an elevated blood urea nitrogen level as uremia rather than as gastrointestinal bleeding.

Most errors in management occurred in overreliance on blood transfusions, reluctance to take positive steps toward diagnosis, and procrastination with surgical treatment. The authors conclude that certain selected patients will be saved by more frequent and prompt use of endoscopy, roentgenographic examination, and surgical intervention.

—John J. Hudock, M.D.

Prognosis in Acute and Chronic Regional Enteritis. Frank Gump and Michael J. Lepore. *Gastroenterology*, 1960, 39: 694.

The authors review their findings in the study of 165 patients with regional enteritis treated at the Columbia-Presbyterian Hospital of New York, New York between 1932 and 1957. In the surgical treatment for these conditions the results of ileocolectomy were clearly superior to those recorded for enterectomy. The authors have practically abandoned enterectomy except for the management of skip areas and lesions localized to the jejunum. Four patients treated by vagotomy failed to respond satisfactorily.

The advisability of appendectomy in this condition has been discussed frequently in the literature because of the danger of fistula formation. Noted were two anterior abdominal wall fistulas both of which originated in the diseased terminal ileum and not in the cecum. The authors conclude that in acute ileitis, appendectomy is indicated and safe, provided the cecum is not diseased. Findings failed to support the theses that established or burned out disease is more amenable to surgical cure and that delaying operation for a prolonged period of medical therapy seems to have no deleterious influence on the ultimate result.

A study was made of 9 patients submitted to long term adrenal steroid therapy; only 1 was apparently cured. Four went into sustained remission, 2 required operation for progression of the disease, and 2 could not continue with adrenal steroids because of complications attributed to the hormones. It was the authors' belief that adrenal steroids may make it possible

for the patient to tolerate his disease better and to maintain better nutrition but it usually does not modify the behavior or appearance of the lesion itself. In fact, on several occasions the authors had to recommend resection of stenosing ileitis despite improvement in that patient's nutrition and sense of well-being. —*Gordon F. Madding, M.D.*

Residual Peristaltic Disorders After Operation for Intestinal Atresia; Therapeutic Considerations (Les troubles résiduels du péristaltisme après intervention pour atrésie intestinale; Conséquences thérapeutiques). P. MASSOT. *Ann. chir.*, Par., 1960, 14: 1409.

THIS REPORT is a study of 71 cases of intestinal atresia observed during the last 10 years. Forty-one were females and 30 were males. In 22 cases the atresia was duodenal and in 7 of these there was an associated mongolism. Of the remaining cases 14 were jejunal, 8 jejunoileal, and 26 ileal. In 1 case most of the small bowel was involved. Hydramnios was present in 6 of the cases of duodenal atresia. Vomiting was present in all but 1 case. Meconium was passed in 7 cases only.

In the group with atresia of the small intestine, abdominal distention was present in 30 and peristaltic waves were seen in 7. Plain films of the abdomen are usually diagnostic, and the use of contrast media should be avoided. The author dwells mostly on failure of the return of peristalsis in the bowel segment proximal to the atresia after operation. This phenomenon was seen more often in small bowel atresia than in duodenal atresia. There were 11 late deaths among the patients with small bowel atresia. Two were caused by other associated malformations. Three were the result of breakdown of the anastomosis. In the remaining 6, death was caused by failure of peristalsis and persistent dilatation of the segment proximal to the anastomosis. There were 5 late deaths among the patients with duodenal atresia. One was caused by bronchopneumonia from aspirated barium. Another patient died when his parents took him home 5 days postoperatively. In the last 3, death was the result of failure of function of the anastomosis. In 2 patients who survived there was a persistent duodenal atony after 3 years and 10 months, respectively.

The author reviews the various procedures advocated and actually used in his cases. He concludes that in the case of small bowel atresia a generous resection, up to 50 cm., with end-to-end anastomosis will give the best results, with 55 per cent over-all mortality and a quicker return of normal peristalsis. On the other hand, more limited resections or bypassing procedures have resulted in poor results with 84 per cent over-all mortality. Diarrhea may result from the more extensive resections. However, this will disappear within a few months. In the case of duodenal atresia, the author admits that his experience with the various procedures has been scanty and therefore not conclusive. He advocates a double anastomosis—simultaneous gastrojejunostomy and duodenojejunostomy. This procedure was practiced in 3 cases with good result. In 12 cases duodenojejunostomy was performed alone and 9 of the patients died. In 4 of the latter, the cause of death was failure of transit through the duodenum. In 1 survivor this difficulty persisted.

In conclusion, this study demonstrates the high incidence of peristaltic disorders after operation for intestinal atresia and the late deaths that result from it. To prevent this occurrence the author advocates a wider resection at the level of the small bowel and a double anastomosis at the level of the duodenum.

—*Joseph J. Bahuth, M.D.*

A 30 Year Survey of Acute Intussusception in Childhood. D. CAMPBELL COOKE and E. C. LEWIS. *Lancet*, Lond., 1960, 2: 1359.

THE AUTHORS have reviewed the cases of 269 patients with acute intussusception in childhood who were admitted over the period 1929 through 1958 to the Royal Hospital, Wolverhampton, England.

The age of the patients in this survey was comparable to that in most other series with the largest group of patients consisting of children between the ages of 3 and 9 months. Boys outnumbered the girls in this series by an approximate ratio of 2 to 1. The cause of intussusception in this age group remains quite vague. No single factor may be held responsible for intussusception at all levels of the intestinal tract.

To the recognized tetrad of symptoms—pain, vomiting, rectal bleeding, and a palpable mass—the authors have suggested the possible addition of pallor as a common finding. They have divided the various types of intussusception into separate groups which indicate (1) the area of bowel at which invagination starts and (2) the area of bowel receiving the invagination. Thus we have ileoileal, ileocolic, ileocecal, cecocolic, compound or ileoileocecal, and multiple intussusceptions. Of these, the ileoileal appears to be the most lethal type.

The authors suggest that hydrostatic reduction by barium enema is being carried out more frequently in their institution, although laparotomy was performed in the majority of cases reported, 85 per cent, with a mortality rate of 12.7 per cent. The mortality rate is accounted for largely by the patients who required resection, which was necessary in 22 instances, 8.2 per cent, with a mortality of 45 per cent.

In the seriously ill child with a gross obstruction, exteriorization of the mass and proximal ileostomy are suggested as alternate methods of treatment. Only 10 cases, 3.8 per cent, in this series recurred at variable intervals after the first operation. Deliberate fixation was not practiced in this series.

Barium enema was noted to be successful in reducing the intussusception in about 1 out of 3 patients in whom it was tried in this particular group. It is recommended at the present time that a trial be given the more conservative method and laparotomy be resorted to only when reduction does not occur promptly by this technique.

—*Harvey N. Lippman, M.D.*

Diverticula of the Colon and Their Relation to the Muscle Layers and Blood Vessels. W. W. SLACK. *Gastroenterology*, 1960, 39: 708.

IT IS RECOGNIZED that a rectal hemorrhage, either mild or severe, is a complication of diverticulitis of the colon. The author studied 36 specimens of diverticulitis at St. Mark's Hospital, London, England and autopsy specimens from other hospitals, and a further

assessment of the relation of the blood vessels to the muscle layers and diverticula was obtained.

Diagrams and roentgenograms as well as photomicrographs are incorporated in the article showing the position of the main or primary diverticula of the colon and the relation to the circumferential blood vessels of the colon. These circumferential vessels pass over the diverticula in close contact and are the probable source of major hemorrhages in diverticulitis. Also demonstrated are small protrusions of secondary diverticula that sometimes appear between the antimesenteric taeniae which occur only in the more advanced stages of formation of diverticula. These protrusions push through gaps in the muscle in association with small pre-existing blood vessels.

—Gordon F. Madding, M.D.

Colectomy and Ileorectal Anastomosis in the Surgical Treatment of Ulcerative Colitis. A. F. G. ANDERSON. *Austral. N. Zealand J. Surg.*, 1960, 30: 107.

A STUDY of 34 cases is reviewed. Only 18 patients had a good or satisfactory result. There was no operative mortality. In 9 cases there were incidents of intestinal obstruction, and 2 of these patients who had previously poor functional results with consequent long continued diarrhea and debility died within 48 hours of operations for its relief. In 6 cases the result after the operation was poor, but these patients gradually improved and are now classed as having good or satisfactory results. In 4 of these the improvement took place as the proctitis resolved, and it is concluded that residual proctitis bears an important relationship to the frequency and consistency of the bowel actions and the general well-being of the patient. In 1 case, diarrhea was associated with stenosis at the suture line and responded dramatically to simple dilatation.

It is concluded that, in selecting patients for this type of operation, the rectum should not be more than mildly affected as judged sigmoidoscopically but that the presence of ileal involvement is not nearly so important. The younger patients—those less than 25 years of age at the time of operation—have been shown to have a better chance of a good result. In children, in particular, this operation should be seriously considered.

The group of patients subjected to a 2 stage operation with colectomy and ileostomy as the first stage, followed up some 2 to 3 months later by ileorectal anastomosis, have given the best results.

—Ely Elliott Lazarus, M.D.

The Clinical Application of Recent Experimental Conclusions in the Treatment of Intestinal Obstruction. JOHN J. CRAWFORD and PAUL NEMIR, JR. *Surg. Clin. N. America*, 1960, 40: 1513.

THIS REPORT gives a brief historical summary of the important steps in the progress of the treatment of intestinal obstruction from 1900 to the present time. The two big items are the importance of parenteral fluid administration, particularly electrolyte solutions, and of reducing distention by suction drainage. Recently, considerable work has been forthcoming with regard to strangulated intestinal obstruction in which the toxic nature of the fluid formed within the lumen of the gut has been well evaluated. The probabilities are that the clostridial organisms frequently within produce exotoxins which are enzyme in nature, and the abnormal hemoglobin breakdown substances with toxic properties can be absorbed.

Four specific factors emphasized as necessary to accomplish the best treatment of intestinal obstruction are (1) A prompt recognition of the condition before more severe anatomic changes have occurred; (2) the prevention of shock, hemorrhage, dehydration, and electrolyte imbalance by the judicious use of electrolyte solution and blood; (3) the significance of the bacterial products which establish the wisdom of antibiotic therapy; and (4) surgical removal of any gangrenous intestine at the earliest possible time.

—Robert W. Williams, M.D.

Resection of Carcinoma of the Colon in the Presence of Obstruction. C. PATRICK SAMES. *Lancet*, Lond., 1960, 2: 948.

THE AUTHOR advocates primary resection of the left part of the colon in selected cases of obstruction. Surgical teaching has correctly emphasized the dangers of immediate anastomosis of the colon in cases of obstruction. The classical procedure has involved three separate operations: (1) establishment of a proximal functioning colostomy, (2) resection of the diseased portion of bowel, and (3) closure of the colostomy. Before the introduction of antibiotics, the only alternative to this procedure was the Paul-Mikulicz resection with subsequent extraperitoneal closure of a double barrelled colostomy. This procedure does not permit a wide resection of the lymphatic field but has heretofore been the only method of removing the growth at the first surgical intervention.

Primary resection is best reserved for those cases in which the growth is situated above the peritoneal shelf. If the rectum is mobilized at the first operation, difficulty may be found in restoring continuity. Decompression of the intestine is best accomplished with the coils removed from the peritoneal cavity. Reconstruction of continuity of the bowel may be delayed indefinitely until the patient is in optimum condition.

The author reports 4 cases with excellent postoperative results. *—Carl H. Calman, M.D.*

LIVER, BILIARY SYSTEM, AND PANCREAS

A Comparison of the Effects of General Hypothermia and Arfonad-Induced Hypotension on Survival of Dogs After Temporary Acute Occlusion of the Portal Vein. EDWIN L. CARTER and CHARLES E. HUGGINS. *Surgery*, 1960, 48: 1028.

IT HAD BEEN SHOWN by previous workers that ligation of the portal vein produced death in dogs in an average time of 66 minutes. The present study was undertaken to evaluate the effects of arfonad-induced hypotension or hypothermia in the prolongation of the safe period of portal vein occlusion.

Fifty dogs, divided into groups of 10 animals each underwent acute portal vein occlusion. The first 3 groups of animals were subjected to 30, 40, and 60 minutes of complete occlusion of the portal vein between the coronary vein and the porta hepatis. Those animals subjected to 60 minutes of portal vein occlusion had a mortality rate of 80 per cent.

The next group of animals was subjected to hypothermia by immersion in ice water and were followed up until their temperature fell to between 21 and 25 degrees C. Sixty minutes of portal occlusion in this group of animals caused no death and the animals were alive and well 3 weeks after the procedure was carried out.

The final group of 10 dogs underwent portal occlusion after arfonad-induced hypotension had been established, and the mortality rate in this group of animals was 30 per cent.

It is concluded that hypothermia provides significant protection against the lethal effects of temporary portal vein occlusion in dogs and that the reduction of portal vein pressure in the hypothermic animals does not completely explain the prevention of death.

—*John H. Davis, M.D.*

Clinical Versus Actuarial Prediction in the Differential Diagnosis of Jaundice. WILLIAM B. MARTIN, P. C. APOSTOLAKOS, and H. ROAZEN. *Am. J. M. Sc.*, 1960, 240: 571.

CLINICAL PROTOCOLS of 48 cases of jaundice were studied by 6 interns, 9 general practitioners, and 9 specialists in internal medicine or abdominal surgery. Each doctor classified each case as either obstructive jaundice or parenchymatous liver disease. The physicians' opinions were then compared with the predictions resulting from the use of the following statistical formula: Prediction Score=10 CCF+TT. CCF stands for cephalin cholesterol flocculation test and TT for thymol turbidity. If the prediction score was 22.5 or greater, the case was predicted as parenchymatous liver disease. If the score was less than 22.5, the jaundice was classified as obstructive. The physicians' predictions and the actuarial predictions with the formula were then compared with the actual diagnosis as determined by operation, biopsy, necropsy, or clinical study.

The prediction formula accurately classified the type of jaundice in 79.2 per cent of the 48 cases. The physicians' predictions were correct in 82.3 per cent. Of the 3 classifications of physicians, the specialists were most accurate, with 86.6 correct predictions. Interns predicted 81.9 per cent of cases accurately, and general practitioners were correct in 78.2 per cent. Statistically, the superior predictions of the specialists over the other groups were significant, while the minor differences between the predictions of the interns, the general practitioners, and the prediction formula were not significant. The difference between predictions of the entire group of 24 physicians and the formula was not statistically significant.

The mean time required for each physician to predict all 48 cases was 3.5 hours. For the prediction formula 24 minutes were required, or 30 seconds for each case.

Cephalin cholesterol flocculation was the most accurate single test in the series. A more accurate prediction formula is possible if the alkaline phosphatase and other clinical findings are utilized.

Adoption of a prediction formula to replace clinical study of a case is not advocated, but such a formula may be a useful adjunct in certain instances.

—*Stanley W. Tuell, M.D.*

Contribution of Corticosteroids in the Differential Diagnosis of Obstructive Jaundice; Their Effect on the Clinical Course of the Disease. (Text in Greek). J. SYMEONIDIS, S. MELISSAS, A. VOUYOUCAS, and D. GRAIOOS. *Galenus*, 1960, 2: 795.

AS AN AID in the differential diagnosis between the surgical and nonsurgical case of jaundice, prednisolone was given to 27 patients in daily doses of 10 to 30 mgm. for 4 to 10 days. In all but 1 of the 15 patients with clinically proved hepatitis and findings of obstructive jaundice there was an average fall in the serum bilirubin level of 11.3 per cent. The alkaline phosphatase fell 5.7 per cent on the average. The other 12 of the 27 patients showed no fall but a rise in serum bilirubin of an average of 6 per cent and in alkaline phosphatase of 2.5 per cent. In these cases the cause of the jaundice was mechanical obstruction caused by carcinoma of the pancreas or liver in 7, tumor of the liver in 2, duct stones in 2, and echinococcus cyst in 1.

There is no other known explanation of the reduction of serum bilirubin and alkaline phosphatase levels in the patients with hepatitis than the anti-inflammatory effect of corticoids. Nonetheless, these compounds can be of definite value in the treatment of hepatitis and can thus shorten the period of hospitalization.

The authors admit that their series is not large enough to warrant definite conclusions. Further investigation is needed to prove or disprove the diagnostic value of corticoids in cases of jaundice.

—*Nicholas J. Demos, M.D.*

Traumatic Hemobilia Associated with a Hepatoportal Biliary Fistula. WOLFGANG H. MARKGRAF. *Arch. Surg.*, 1960, 81: 860.

THE TERM "traumatic hemobilia" was coined by Sandblom in 1948 to describe hemorrhage into the bile ducts as the result of nonpenetrating trauma to the liver. The trauma causes a laceration of the liver without disrupting the capsule or a laceration of the liver where the capsule adheres to the diaphragm.

It is well known that blood does not clot well in the presence of bile, but clot blockage of the biliary tree does occur in these cases and then bile and blood accumulate within the cavity until sufficient pressure is developed to expel the contents through the bile ducts. At this time an episode of gastrointestinal bleeding occurs accompanied by severe colicky pain in the right upper quadrant. The onset of pain forebodes the appearance of melena.

After abdominal injury the pattern of attack of hemobilia may be any combination of the following: (1) pain simulating biliary colic; (2) hematemesis and melena; or (3) common duct obstruction with varying degrees of jaundice. In pronounced hemobilia, secondary anemia or shock occurs. Biliary decompression in these cases has frequently resulted in cure.

A case report of an unusual three-way fistula, arteriovenous-biliary type, is reported.

—*David E. Hallstrand, M.D.*

Management of Patients with Unsatisfactory Results After Cholecystectomy. RICHARD B. CATTELL and JOHN W. BRAASCH. *Canad. M. Ass. J.*, 1960, 83: 987.

THE AUTHORS consider a group of patients complaining of continuing or recurrent symptoms of upper ab-

dominal pain, jaundice, chills, fever, or external drainage of bile after cholecystectomy. The conditions to be considered are retained common duct stones, fibrosis of the sphincter of Oddi, benign biliary stricture, gallbladder remnants, and cystic duct stumps.

Intravenous cholangiography is of great help in the differential diagnosis of these conditions. When the bile duct is obstructed, either by stones or by fibrosis, it compensates by dilatation and delayed emptying. When the diameter of the duct is in the range of 10 to 15 mm., obstruction cannot be ruled out. If, in addition, the dye concentration in the duct fails to decrease or, preferably, increases 1 to 2 hours after injection, an obstruction is present at the lower end.

Evaluation of the size of the common duct is of definite importance in a patient who has had cholecystectomy. The authors do not believe there is evidence that the unobstructed common duct increases in size in man after cholecystectomy. The number of secondary biliary tract procedures for recurrent or retained common duct stones could be materially reduced if indications for exploring the duct at the time of cholecystectomy were increased and if this exploration were carried out meticulously.

Their criteria for the exploration of the common duct include the presence of jaundice, chills or fever, an enlarged common duct, an enlarged cystic duct, or small stones. In addition, the bile duct is explored in some patients who have had multiple attacks of colic. Exploration of the duct is definitely contraindicated when the duct is small because of the danger of producing a stricture. They have not utilized operative cholangiography as a routine procedure. The authors still advocate the use of the long-limb T tube after sphincterotomy and discount the reports of an increased incidence of pancreatitis after this procedure.

Of 501 patients with benign biliary stricture, 30 per cent either died from the effects of extrahepatic biliary obstruction or during the postoperative period after an attempted repair, or were alive but continued to have chills, fever, and jaundice. The authors' procedure of choice is an end-to-end anastomosis of the two ends of the duct. Satisfactory results were obtained in 51 per cent of their cases. If this operation cannot be performed, they favor hepaticojejunostomy utilizing a loop of proximal jejunum. In either case, they prefer to perform the anastomosis over a T tube. Their postoperative mortality after primary repair of bile duct strictures is approximately 3 per cent. If there is a severe degree of liver damage, they advise hepaticostomy as a primary procedure. After a 2 month interval, a definitive anastomosis can be accomplished. —*Alan Thal, M.D.*

Choledocholithiasis. JACK NAYLOR and WILTON A. DOANE. *California M.*, 1960, 93: 337.

ONE HUNDRED PATIENTS having common bile duct exploration at the Cottage Hospital, Santa Barbara, California between 1949 and 1959 were studied in an attempt to give insight into the diagnosis and effective treatment of choledocholithiasis. Of the 100 patients, 66 were women and 34 were men. Fifty of the patients had common duct stones. Fifty-six per cent of the women and 37 per cent of the men had stones.

Correlations were made between the incidence of choledocholithiasis as verified at operation and the kind and number of choledochal exploratory criteria used, clinical diagnosis of common duct stones, and pathologic changes of the gallbladders removed.

The most frequent criteria for exploration were common duct dilatation and/or thickening which were present in 63 cases, in association with stones in 38. Jaundice in 50 cases was associated with stones in 26.

It is of interest to note that as the number of criteria increased, the proportion of cases with stones increased. Stones were found in 28 of 42 cases with a single reason for exploration and in 5 of 6 in which there were four criteria.

The most reliable single criterion in preoperative diagnosis of stones was palpation of common bile or hepatic duct stones which occurred in 15 of 17 cases—88 per cent. The most reliable group of criteria consists of a history of jaundice and palpable stones. The clinical diagnosis of choledocholithiasis was correct in only 17 cases. The authors conclude that surgeons are probably not justified in exploring every common duct on the basis of any single criterion. Each operative case merits individual decision for exploration based upon conditions present, including appraisal of operative risk, anatomic factors, and the number and kind of exploratory criteria observed at the operating table.

The incidence of acute and chronic cholecystitis was about the same in patients who had common duct stones as in those who did not, indicating that acuity of disease is not a helpful factor in diagnosing choledocholithiasis. The authors believe it should be possible to remove all stones present at operation, yet in their series proved retention of stones was present in 3 cases. —*John J. Hudock, M.D.*

Cystic Dilatations of the Common Bile Duct (Zystische Erweiterungen des Ductus choledochus). A. VON LUTZKI. *Zbl. Chir.*, 1960, 85: 1886.

SINCE the first description of this disease in 1724, about 400 cases have been reported, half of them since 1943. About 80 per cent of these cases were in females younger than age 25. As to the cause, many theories have been advanced. The author favors that of Yotuyanagi. The solid cell cord which represents the common duct at a certain stage of embryonal life fails to recanalize equally at all levels. Common duct cysts, cystic dilatation of the common duct, megaloduct, and diverticulum of the common duct are synonyms. The author believes that congenital cystic dilatation would be the best term.

In the majority of cases, the opening of the cystic and of the common hepatic ducts is found in the upper pole of the cyst. In rare cases, the hepatic ducts open separately into the structure. The lower pole is connected with the duodenum by the not dilated, retroduodenal, and pancreatic part of the common duct, usually several centimeters in length. In contrast to the concentric dilatation found in obstruction, the cystic dilatation is eccentric and limited to certain sections. The size of the cysts varies and they can contain from 30 to several thousand c.c. of fluid. The wall is often thickened and shows inflammatory reac-

tion. Stones are rare; infection of the contents, however, is found frequently. Liver changes are found when obstruction occurs and can progress to biliary cirrhosis. Ascites can occur, if the portal vein is compressed or thrombosed.

The most frequent clinical findings are tumor and icterus in about 80 per cent of the cases; pain occurs in less than 66 per cent. The importance of a good history is stressed. Other symptoms are dyspepsia, colics, and vomiting. Traumatic or inflammatory rupture causes severe peritonitis.

The exact diagnosis has been made preoperatively in only 10 per cent of the patients operated on.

Roentgen ray examination is very helpful; the contrast medium should be given intravenously for better results.

The most important differential diagnoses are mentioned. The treatment of choice is operation, since the condition will otherwise cause lethal complications. Three methods have been advocated: (1) anastomosis between cyst and duodenum or cholecystoduodenostomy or jejunostomy; (2) to avoid ascending infection, a Roux en Y anastomosis between the cyst and the jejunum can be made; and (3) the ideal operation is the resection of the cyst with either end-to-end anastomosis of the proximal and distal portion of the common duct or implantation of the proximal end into the duodenum.

The case of a 32 year old female is presented on whom a choledochocystoduodenostomy was performed in 1955. The patient had to be reoperated on in 1959 because of obliteration of the stoma and stenosis of the distal portion of the common duct. According to the literature, choledochocystoduodenostomy is successful in only about 50 per cent of cases. The author strongly advocates the resection of these cysts if technically possible and considers all other operations palliative. —*Eckhard Fischer, M.D.*

Bile Peritonitis. H. Ellis and K. Cronin. *Brit. J. Surg.*, 1960, 48: 166.

The authors present a study of 22 patients with bile peritonitis treated in the last 20 years at the Radcliffe Infirmary, Oxford, England and also review previous publications on this subject.

Bile peritonitis is an uncommon abdominal catastrophe. In spite of its rarity, however, it forms a subject of considerable interest because of the wide range of pathologic processes, some but poorly understood, which give rise to this condition.

The authors classify the causes of bile peritonitis as follows: (1) traumatic rupture, (2) postoperative leakage, (3) perforation of an acutely inflamed gallbladder or duct, (4) transudation of bile through the walls of a gangrenous but nonperforated gallbladder, (5) rupture of a subcapsular cholangitic abscess of the liver in cholangiohepatitis, (6) perforation of an apparently normal gallbladder or duct, and (7) idiopathic, i.e., when there is no demonstrable pathologic change in the biliary tract.

Two conditions must be differentiated from true bile peritonitis. These are, first, the escape of duodenal contents on perforation of this organ which are often heavily bile stained and, second, the bilious ascites that occurs in hepatic obstruction.

The sites of leakage of bile in these cases were the gallbladder in 13, the common bile duct in 5, the liver in 2, and unknown in 2 others.

There were 13 males and 9 females, whose ages ranged from 6 weeks to 88 years. Eleven of the patients died. All except 2 infants had acute abdominal pain. In a few cases the pain appeared with dramatic suddenness and intensity, but in most of them it had been present for some time.

The cause of death is, as yet, unexplained although it seems that the length of the history is of supreme importance. The older the patient, the worse the outlook and the longer the history, the more likely is death. The three theories discussed for the cause of mortality are: (1) The bile is infected and produces a bacterial peritonitis, (2) excessive fluid loss into the peritoneal cavity results in severe shock, and (3) cholemia results from absorption of bile salts. The authors mention, however, that none of these theories seems to fully explain the cause of death in all patients.

—*Donald M. Clough, M.D.*

Leucine-Aminopeptidase and Other Enzymes in Disease of the Biliary Tract (Das Verhalten der Leucinaminopeptidase und anderer Enzyme in Serum bei Leber-, Gallen- und Pankreaserkrankungen). K. H. Göggel, W. Creutzfeldt, and J. Murucas. *Deut. med. Wschr.*, 1960, 85: 1756, 1808.

The authors report extensive enzyme studies on some 800 patients. They studied the leucine-aminopeptidase, alkaline phosphatase, fructose aldolase, and the transaminases. They were mainly interested in the leucine-aminopeptidase and give a detailed description of how this study was carried out.

Of a group of 28 patients with obstructive jaundice from extrahepatic disease, such as stones, strictures, and tumors, all had elevated serum leucine-aminopeptidase; many of these had no elevation of the alkaline phosphatase. In general, the peptidase elevations paralleled elevated serum bilirubins. The test did not distinguish between the mechanisms of obstruction, however.

Of 14 patients with ascending cholangitis, 13 had elevated peptidases. These values stayed up for weeks after bilirubins and phosphatases had returned to normal. Of 16 patients with liver metastases from nonbiliary tract primary tumors, 15 had elevated peptidases. Only 7 of these had elevated phosphatases and 4 had hyperbilirubinemia.

In a series of viral hepatitis cases, bilirubin and leucine peptidases were up in all, whereas the phosphatases were usually normal. The oxalacetic transaminase, the pyruvic transaminase, and the fructose-aldolase were variably elevated. In cirrhosis there was great variation in all the values; the transaminase elevations seemed to be an index of acute or recent cell necrosis.

In acute pancreatitis the peptidase values were elevated; they were normal in chronic pancreatitis. The peptidase seemed a better diagnostic test in acute pancreatitis than the blood and urine diastase, because the peptidase values stayed up longer.

In 21 malignant tumors without metastases, the leucine-peptidase was up in 13, the fructose-aldolase in 6. Bilirubin and phosphatase values were normal.

Six patients with acute myocardial infarction were tested. The leucine-peptidases were all normal. The transaminases and fructose-aldolases were markedly elevated.

It is seen that the serum enzymes, particularly the peptidase, are elevated in a wide range of clinical problems. The authors believe the determination of the aminopeptidase is definitely superior to that of the alkaline phosphatase; the peptidase was elevated in all cases of common duct obstruction, either partial or complete, whereas the alkaline phosphatase was normal in 50 per cent.

The authors cannot confirm the impression of Goldberg and Rutenburg that the elevation of leucine-aminopeptidase is a diagnostic test for carcinoma of the pancreas; elevated values are found in so many conditions that it probably can serve best as a general screening procedure for the detection of a number of serious diseases.

There are few data available on the mechanisms responsible for the increased enzyme activities in these diseases. Perhaps in biliary obstruction it is an interference with the excretory pathway. Possibly damaged or destroyed cells, as in hepatitis, cirrhosis, or in myocardial infarction, release enzymes in increased amounts. The elevations associated with malignancy cases could be due to increased enzyme production from tumor cells or to tumor cell necrosis.

Because of lack of organ specificity of enzyme assays, at the present time they must be taken together in an "enzyme profile" and be considered as useful empirical observations. The determination of the serum leucine-aminopeptidase is definitely of more value than that of the alkaline phosphatase in various liver and pancreatic diseases and is an important addition to the "enzyme profile."

—*William B. Gallagher, M.D.*

Calcifications of the Pancreas as Studied by Means of Pneumotomography (Sulle calcificazioni pancreatiche studiate con la pneumostratipancreatografia). L. PERILLI and E. FANINI. *Radiol. med.*, Milano, 1960, 46: 834.

THREE CASES of calcification of the pancreas are reported from the Department of Radiology of the County Hospital of Pescara, Italy.

In the 3 patients the diagnosis was achieved by means of the so-called pneumotomography of the pancreas, i.e., the roentgenologic visualization of the pancreas by means of retropneumoperitoneum associated with lateral tomography. The examination is performed as follows: 2,500 ml. of oxygen are introduced into the retroperitoneal space by the precoccygeal route under local anesthesia. The patient is then given a lemonade with a small amount of sodium bicarbonate and is asked to lie on the right side for a short period of time. Tomograms are then taken at 2 cm. intervals with the patient in the upright position. The pancreas is well visualized and it appears as an ovoid shadow located immediately in front of the spine and behind the stomach and of the size of a hen's egg, with its major diameter directed anteriorly and downward.

Although isolated complications were reported—among the most serious ones: shock, pulmonary embolism, and, in one instance, paresis—the procedure is considered to present no special hazard if performed properly by an experienced physician. Its usefulness in the diagnosis of pancreatic conditions, which often represents a challenge to the roentgenologist, is emphasized by the authors in concluding their article.

—*Riccardo Benvenuto, M.D.*

Cystoduodenal Anastomosis for Cephalic Cyst of the Pancreas. MAURICE MERCADIER. *Ann. Surg.*, 1961, 153: 81.

THE AUTHOR REPORTS the surgical management of 8 patients with pseudocysts of the head of the pancreas by means of internal drainage of the cyst into the duodenum through a transduodenal cystoduodenostomy. This seems to be an excellent type of internal drainage in that it allows drainage of the cystic pouch with little or no reflux of the digestive content into the cyst. Despite the adequacy of the method, it has been used relatively infrequently, there being only 20 cases reported in the literature at the time of this investigation. In all observations, this mode of drainage has evidently been quite efficient. In a few cases the secondary disappearance of the cyst has been verified.

The surgical procedure is simple and consists of the establishment transduodenally of a communication between the cyst and a segment of the duodenal frame, across the zone of contiguity of the latter with the pancreas. The ideal position is below the ampulla of Vater, obliquely directed downward toward the duodenum at the declivitous point or site equidistant from the anterior and the posterior surfaces of the head of the pancreas. With these considerations, the chance of vessel or choledochal injury is reduced to a minimum.

The clinical results of this cystoduodenostomy have been excellent in the author's clinic, as well as in other cases reviewed in the literature. Postoperative and late follow-up reports have not disclosed any complication which could be attributed to the procedure.

It is the author's opinion that this type of drainage should be employed more often when the anatomic situation of the pancreatic cyst, paraduodenal or juxtaduodenal, makes it possible.

—*Ely Elliott Lazarus, M.D.*

The Etiology, Course, and Surgical Aspects of Pancreatitis. J. T. BOYER and I. R. MACKAY. *Austral. N. Zealand J. Surg.*, 1960, 30: 150.

A REVIEW of 108 consecutive cases of pancreatitis at the Clinical Research Unit of the Royal Melbourne Hospital, Melbourne, Australia is presented. In order to quantitate frequency of attacks, pancreatitis was classified as acute in 29, chronic relapsing in 73, and chronic "silent" in 6. There were 57 females and 51 males with an average age of 47 years for both sexes. Clinical signs and symptoms were variable and included pain, vomiting, fever, leukocytosis, increased sedimentation rate, and flank discoloration in 2 cases. Common erroneous diagnoses are acute cholecystitis and perforated duodenal ulcer. Coexisting conditions included gallstones in 46, alcoholism in 24, antecedent operation in 17, and vascular disease in 17.

Laboratory studies revealed jaundice in 29 cases, hyperlipemia in 24 cases, disturbed glucose tolerance in 27 cases, and an abnormal secretin test in 14. Surgical biopsies showed a wide variety of histologic findings including histologically normal tissue, interstitial inflammation, hemorrhagic pancreatitis, necrosis or abscess, acute inflammation, fibrosis, and fat replacement.

Over 70 per cent of the patients in this series had recurrences, which emphasizes the fact that pancreatitis is inherently a relapsing disease. Remission occurred in 44 per cent of the relapsing patients in this series, including 35 per cent treated medically and 61 per cent of those treated surgically. Surgical treatment consisted primarily of cholecystectomy for cholelithiasis. No patient had stones in the common bile duct or evidence of biliary obstruction. Splanchnic sympathectomy in 1 patient provided only temporary benefit. If patients having had previous cholecystectomy were added to the surgical group, the remission rate for surgically treated cases would be near that of those treated by conservative means.

Diabetes mellitus occurred in 16 patients, its incidence directly related to the number of attacks of pancreatitis. Steatorrhea caused by pancreatic insufficiency was not common but was most prevalent in the group with chronic silent pancreatitis.

Eighteen patients died during the course of the study, attributed directly in 10 to pancreatitis, and 5 deaths occurred during the initial acute attack. There were no deaths from pancreatitis in patients under the age of 40.

The authors conclude that the further understanding of pancreatitis demands that efforts be made to determine the cause in every case and the precipitating cause of each attack. The value of surgery, which appears to be limited in the over-all treatment of pancreatitis, should be carefully assessed in the light of the natural history of the disease. The natural history of the relapsing disease may tend towards recovery under a conservative regime. This makes it difficult to evaluate surgery which is frequently accompanied by restrictions against alcoholic and dietary excesses.

—Patrick F. Jewell, M.D.

Chronic Duodenal Obstruction: A Mechanovascular Etiology of Pancreatitis—I, Report of 6 Cases Illustrating This Clinical Variety. DAVID A. DREILING, PAUL A. KIRSCHNER, and HAROLD NEMSER. *Am. J. Digest. Dis.*, 1960, 5: 991.

A NUMBER of years ago, several investigators indicated that increased duodenal pressure might be a possible mechanism in the pathogenesis of alcoholic pancreatitis. Recently, the Pfeffer method of producing experimental pancreatitis was published indicating that pancreatitis was induced in the dog by ligation of the duodenum at both ends. Although no claim for significance of duodenal obstruction as an etiologic mechanism in human pancreatitis was made by Pfeffer and his co-workers, the observations made by the authors would indicate a clinical counterpart of the Pfeffer mechanism for producing acute experimental pancreatitis.

Evidence of the association of pancreatitis and duodenal obstruction observed in 6 patients treated at the Mount Sinai Hospital, New York, New York, is presented in detail. It is concluded that chronic duodenal obstruction from a variety of causes, such as superior mesenteric compression, proximal loop obstruction, inflammatory stricture, annular pancreatic stenosis, and malignant constriction, is an etiologic factor in the induction of pancreatic inflammatory disease. Postgastrectomy pancreatitis results not only from direct trauma to the pancreas, its duct, or its blood supply but also may follow obstruction of the proximal loop. It is of importance that proximal loop distention does not occur, and the authors suggest that prevention of such a complication might be avoided by positioning the nasogastric tube beyond the gastroenteric stoma into the proximal loop.

A further conclusion drawn by the authors is that occurrence of attacks of acute pancreatitis in patients with annular pancreas may be related more to the duodenal narrowing than to the anatomic abnormality. They advise that these patients and others with duodenal strictures be kept on a low-residue diet to prevent occlusion of the stenotic bowel. Whether the physiologic mechanism inducing pancreatitis in patients with chronic duodenal obstruction is mechanical or vascular is a problem that remains to be determined by further experimental study.

—James H. Holman, M.D.

Chronic Duodenal Obstruction: A Mechanovascular Etiology of Pancreatitis—II, Experimental Observations. A. PAULINO-NETTO and DAVID A. DREILING. *Am. J. Digest. Dis.*, 1960, 5: 1006.

THE AUTHORS produced acute pancreatitis in dogs by the closed duodenal loop technique, and anticholinergic, anti-inflammatory, and metabolic depressant drugs were administered to the animals before and after this procedure in order to evaluate their protective action against this variety of experimental pancreatitis.

Only two of the drugs protected the dogs against the pancreatic damage produced by acute duodenal obstruction. With propylthiouracil the protection was minimal; with oxyphenbutazone the protection was marked.

The primary mechanisms in the production of pancreatitis by duodenal obstruction are incomplete pancreatic duct obstruction and perhaps backflow of the duodenal loop fluid into the pancreatic ductal system. In the experimental procedure of the Pfeffer loop the pressure increases gradually within the pancreas as the loop becomes distended. In dogs in which the pancreatic duct was drained, pancreatitis did not develop, and in animals in which the loop perforated, there was far less pancreatic damage than in control groups. This suggests that intrapancreatic ductal hypertension is the primary cause of the induced pancreatitis by virtue of transmission of increased pressure from the duodenum to the pancreatic duct system. Vascular interference probably plays only a secondary role in determining the ultimate extent of disease.

It is the authors' contention that in cases diagnosed as acute pancreatitis, in which there is any suspicion of acute duodenal obstruction, the patient should be treated surgically before two complications—perfora-

tion of the duodenum and/or acute edematous and hemorrhagic pancreatitis—develop. Chronic pancreatitis, likewise, may complicate chronic duodenal obstruction and may be prevented by relief of such obstruction. —*James H. Holman, M.D.*

Report of 57 Cases of Acute Pancreatitis (A propos de 57 observations de pancréatite aiguë). ORLANDO F. LONGO. *Mém. Acad. chir.*, Par., 1960, 86: 839.

THE AUTHOR reports the cases of 57 patients with acute pancreatitis of whom 3 were operated upon during the acute attack and 37 after the attack had passed. Seventeen of the patients were not operated upon.

The acute pancreatitis was discovered at laparotomy in the 3 operated upon during the acute attack. The diagnoses, which were correct, had been: perforated peptic ulcer, perforation of the gallbladder, and intestinal obstruction. All of these patients died, and this confirms the seriousness of any surgical procedure in acute pancreatitis.

Of the 40 patients operated on, 20 had stones in the gallbladder and 7 patients had stones in the common bile duct. There were 2 malignant tumors of the biliary system in the group. In addition to the 3 deaths of patients operated on as an emergency, there were 2 other deaths. One patient died of cardiac disease after recovering from the acute attack and the fifth died after the instillation of tenth normal hydrochloric acid into the duodenum. Study of the 20 patients without gallstones who were operated on after the acute attack subsided indicated that a reflux mechanism of bile into the pancreatic duct was not responsible for the acute pancreatitis in these patients.

The author has used intravenous novocain which acts by alleviating pain and suppressing reflexes.

In 5 patients, or 8.7 per cent, recurrent acute attacks of pancreatitis developed during a period of observation, the length of which is not stated.

—*Frederick W. Preston, M.D.*

Renal Cortical Necrosis and Insufficiency Complicating Acute Pancreatitis (Nécrose corticale et insuffisance rénale au cours des pancreatites aiguës). G. RICHET, H. DE MONTERA, H. DUCROT, B. DUCROISET, and P. VASSALLI. *Presse méd.*, 1960, 68: 2275, 2332.

THE AUTHORS have observed 12 cases, 2.5 per cent, of renal insufficiency in patients with acute pancreatitis in the past 5 years, among 400 patients with oliguria admitted to Necker Hospital, Paris, France, and have noted isolated reports of this complication in the published literature. The pancreatitis was hemorrhagic in 8 cases and edematous in 4. In 5 instances there was coexistent colon bacillus septicemia after urologic instrumentation; major abdominal trauma; or cholelithiasis 3, which was nonoperative in 1 or surgically treated in 2. The oliguria did not modify the classical syndrome of elevated serum amylase, hypocalcemia, or hyperglycemia. Five renal syndromes were distinguished: prolonged, irreversible anuria with death on the nineteenth day in 1; acute anuria with fulminating pancreatitis and death by the fifth day of onset in 3; anuria, re-established diuresis, and delayed death from the hemorrhagic pancreatitis, superinfection, or hemorrhagic diathesis in 3; anuria, diuresis after 4 to 12 days, and persisting residual renal insufficiency in 3; and renal insufficiency after remission of pancreatitis in 2.

There were 7 autopsy studies, and 2 survivors had renal biopsy examinations. In the autopsy material acute tubulointerstitial nephritis with infarctions was the common pattern; biopsy studies revealed varying degrees of interstitial fibrosis and hyaline deposit or cellular infiltration around the glomeruli. Photomicrographs illustrate these lesions. Renal insufficiency in patients with acute pancreatitis is a grave complication, and, when reversible, leaves a residual functional deficit.

The exact mechanism by which the spectrum of renal disease ranging from cortical necrosis to varying degrees of renal insufficiency, does occur is unknown at present. Several hypotheses suggest themselves: concurrent disease of the pancreas and kidney and nephropathy incited by acute pancreatitis, directly or by "common channel" mechanism. Renal disease pre-existent to an attack of acute pancreatitis cannot be ruled out by the authors' experience to date. The "common channel" theory derives support from anuria with pancreatitis, reported in the literature as rare complications of incompatible blood transfusion, and the hemolytic reactions of prostatectomy and certain gram-negative bacillary septicemias (endotoxemias); anaphylactic shock also is at times accompanied by pancreaticorenal lesions. This variety of exciting factors argues against the "common channel" theory per se. Prolonged and sustained vascular collapse is not regularly a part of the syndrome of acute pancreatitis and it very probably is not a key factor.

Intravascular thrombosis is prominent in experimentally produced pancreatitis and "enzymatic toxemia" is an attractive explanation which is derived from a variety of published observations. It explains the vascular collapse, hypercoagulability then hypocoagulability of the blood caused by circulating trypsin, and their joint effects, fibrin deposition and its partial dissolution, in the kidney. Unrecognized, enterobacterial endotoxemia may be an intermediary factor. —*Edwin J. Pulaski, M.D.*

Treatment of Recurrent Pancreatitis by Resection Inhibition and Retrograde Drainage of the Pancreas. MARSHALL K. BARTLETT and GEORGE L. NARDI. *Ann. Surg.*, 1960, 152: 861.

THE AUTHORS describe an operation which they have used on 5 patients for recurrent pancreatitis. They mention that their initial surgical procedure of choice in patients with recurrent pancreatitis consists of a transduodenal sphincterotomy and exploration of the main pancreatic duct in an attempt to provide adequate drainage of pancreatic secretion into the duodenum. Existing disease of the biliary tract is corrected at the same time. Although these results are fairly satisfactory there have been failures and it is in these failures for which the presently described operation is indicated.

The operation described includes a vagotomy and diverts food and gastric acid from the duodenum as well as provides retrograde drainage of the pancreas.

The operation consists of a splenectomy followed by mobilization of the tail and body of the pancreas to a point just to the right of the superior mesenteric vessels. The antrum is then opened on its posterior wall just proximal to the pylorus and the pancreas is drawn into the antrum. The stomach is then transected at its midpoint and the vagus trunks are divided. The wall of the antrum is pushed down around the neck of the pancreas as close to the head as possible and sutured at that level. The pancreas is transected and the main duct laid open through the anterior surface of the pancreas. The gastric antrum is then closed over the cut ends of the pancreas and gastrointestinal continuity is restored by an antecolic gastrojejunostomy.

This operation reduces pancreatic stimulation by diverting food and acid from the duodenum and by vagotomy. Retrograde drainage of the pancreatic duct system is also provided. The authors have found the results to be encouraging but mention that the number of patients treated is small and the follow-up period is too short to allow any real conclusions to be drawn. —*Donald M. Clough, M.D.*

Carcinoma of the Islands of Langerhans (Les carcinomes langerhansiens). LUCIEN LEGER, M. PRÉMONT, and GUYET-ROUSSET. *J. chir.*, Par., 1960, 80: 291.

THE AUTHORS REPORT 3 typical cases of carcinoma of the islands of Langerhans and 1 doubtful case. This brings the total number of cases in the world literature to about 53. About 10 per cent of tumors of the islets of Langerhans are malignant. The majority are insulin producing. Some are nonfunctioning, and some are ulcerogenic.

The pathologic findings in these tumors are varied. Usually there is a single mass occupying one portion of the gland, but 20 per cent are multiple. They are usually small, 1 to 1.5 cm. in diameter, but 1 the size of an adult's head has been reported. Two-thirds of the tumors are in the body or tail. Occasionally they may be in the duodenum or in the liver. Metastases most often go to the liver, and the next areas involved are the regional lymph nodes. Only 4 cases of pulmonary metastases are recorded. Histologically these tumors consist of nodules of masses of small cells. The identification of the cell type is often difficult, and it may be impossible to tell from the microscopic appearance whether the tumors are benign or malignant.

The average age of these patients is 50 years. Insulin producing tumors are found in slightly younger patients, 40 to 50 years old, whereas the noninsulin producing tumors are in 50 to 60 year old patients. However, both types have been reported in the young and in the old. Variety of endocrine gland disorders sometimes accompany these lesions.

One of the cases reported was that of a 50 year old woman who was found perspiring and incontinent. She had a hemiparesis which proved to be temporary and positive Babinski signs bilaterally. These symptoms persisted and were accompanied by psychic troubles. Her blood sugar remained below 50 gm. per cent in spite of treatment consisting of intravenous glucose, ACTH, and cortisone. Her electroencephalogram and upper gastrointestinal barium studies were negative. The portal pressure recorded on splenoportography was elevated. On exploratory laparotomy the liver was found to contain many nodules. There was a tumor in the tail of the pancreas which was fixed to surrounding structures. The tumor in the liver was identical with that in the tail of the pancreas, both grossly and microscopically. Azocarmine stain studies to identify beta cells of the islets were negative. The diagnosis was malignant insulinoma. Cortisone was used during the postoperative course and seemed to favorably affect the hypoglycemia. No follow-up was possible in this patient.

The second case was that of a 56 year old man who had signs and symptoms of chronic pancreatitis. At laparotomy a large partially cystic tumor was present in the tail of the pancreas. Histologic section showed masses of small cells characteristic of an islet cell tumor. The patient died 3 days after resection from massive melena. Autopsy revealed metastases in the adrenals and liver.

The third case reported was also that of a large noninsulin producing tumor and in the fourth case the patient had Cushing's syndrome and a tumor in the pancreas which was thought to be malignant but not proved to be so. —*Frederick W. Preston, M.D.*

SURGERY OF THE FEMALE REPRODUCTIVE SYSTEM

UTERUS AND ADNEXA

Ultrastructural Characteristics of Normal and Cancerous Exocervical Epithelium in the Female (Principales caractéristiques ultrastructurales de l'épithélium exocervical normal et cancéreux de la femme). N. HINGLAIS-GUILLAUD. *Bull. Soc. Roy. belg. gyn. obst.*, 1960, 30: 369.

THIS AUTHOR attempts to establish ultramicroscopically differences, if possible specific, between the normal and the cancerous epithelia of the exocervical region of the human female. In this work are included the characteristics observed normally during the various phases of the menstrual cycle. The original text is illustrated with 7 electronmicrographic reproductions, the first 3 taken from normal subjects, the rest from cases of invasive epidermoid cancer.

On the whole, it must be admitted that it is at present impossible, with either the light microscope or the electronic microscope to find differences which are truly characteristic, in a specific sense, for the cancer cell. There are differences, from cell to cell, in the nucleus, and in the nucleolus. The author has encountered a hitherto unreported ultrastructure in the nucleus of the cancer cell, consisting of a lamellar structure of decreased density which is somewhat reminiscent of the epithelial pearl of optical microscopy; however, none of these manifestations is specific, or at least there is insufficient experience accumulated to justify a postulation of specificity.

—John W. Brennan, M.D.

Patency of the Tube During Different Menstrual Phases as Determined by Hysterogram (Die Tubarpassage bei der Hysterosalpingographie in den verschiedenen Phasen des Menstruationszyklus). JAN LINDAHL and CARL-GUSTAF HELANDER. *Gynaecologia*, Basel, 1960, 150: 205.

THE MAIN DEFICIENCY in hysterosalpingography is the fact that in the absence of tubal filling no information can be obtained about the anatomic or functional state of that tube. If an ideal time for a hysterogram could be designated, the occurrence of an iatrogenic "tubal block" could be avoided.

More than 500 hysterograms were made in patients who had had a legal abortion in Stockholm, Sweden, predominantly by vaginal hysterotomy. Excluded were patients with previously recognized tubal disease and those who had undergone surgery or who had postabortal uterine infections. Both tubes were open in 462 patients, one only in 43, and none in 6 patients. The authors postulate that most of the 49 bilateral or unilateral obstructions were due to functional rather than mechanical obstruction.

Endometrial biopsy or curettage was performed in all cases within 2 days in order to determine the date of the endometrium precisely. The data obtained were not convincing, but the general impression was obtained that the tubes will fill most easily in the early secretory phase. *—W. Dieter Bergman, M.D.*

Prednisone and Tetracycline in the Treatment of Gynecologic Pelvic Inflammations (Prednisolone e tetraciclina nelle flogosi pelviche femminili). FULVIO DE GENNARO. *Min. gin.*, 1960, 12: 839.

THE AUTHOR REPORTS on a series of 24 women with pelvic inflammatory processes, both acute and recurrent, treated at the Department of Obstetrics and Gynecology of the City Hospital of Molfetta, Italy.

Treatment, in most of the acute cases, consisted of daily administration of 500 mgm. of tetracycline intravenously for periods of 6 to 8 days associated with graded doses of intravenous prednisone, from 50 to 75 mgm. daily for the first 2 days and 20 to 25 mgm. for the second 2 days, to 10 to 15 mgm. for the last 3 or 4 days. In the recurrent cases, a cycle of oral prednisone was added at the end of the parenteral treatment.

With this therapeutic scheme, the author obtained complete recovery in 17 patients. However in 4 of these, a relapse was noted 2 to 8 months after recovery. These 4 patients did not benefit from the prednisone-tetracycline combination. No endocrine alteration was noted. *—Maria Serratto, M.D.*

Stage I Carcinoma of the Uterine Cervix. FRANK R. LOCK, FRANK C. GREISS, and DAMON D. BLAKE. *Am. J. Obst.*, 1950, 80: 984.

ONE HUNDRED AND EIGHTY-FOUR PATIENTS with stage I cervical cancer were treated by means of optimal radiation, maximal radiation, and several varieties of radical pelvic surgery. Applying these methods either singly or in combination, and allowing for the difficulties of comparing small groups of patients and the influence of unconscious selection, the authors have reached several conclusions.

First, intensive or maximal radiation probably does not improve survival rates. Moreover, radiation complications are unduly high. Further radiation is precluded and radical surgery becomes difficult or impossible because of pelvic necrosis.

Second, optimal dosage levels of pelvic irradiation such as described by Nolan and Garcia may be supplemented by radical hysterectomy and pelvic lymphadenectomy without a prohibitive increase in complications. In this series, combined treatment increased the survival rate from 68.5 to 86 per cent.

Third, selected patients with minimally invasive lesions can be treated by a primary radical operation with excellent results. So far, the survival rate has been 96 per cent.

In the final analysis, therapy must still be carefully individualized to achieve maximum success.

—Lester T. Hibbard, M.D.

Ureteral Stenosis in Carcinoma of the Collum Uteri (Die Ureterstenosen beim Kollumkarzinom). G. ALTVATER and G. IMHOLZ. *Geburtsh. & Frauenh.*, 1960, 20: 1214.

TEN TO 15 PER CENT of the patients treated successfully for cancer of the collum uteri die of ureteral

obstruction, and of all deaths due to urologic complications only two-thirds are due to malignant encroachment. There are essentially 4 types of benign ureteral stenosis: (1) the short prevesical stenosis of the uterine junction after radiation; (2) the extensive pelvic stenosis due to sclerotic fibrous tissue after combined treatment; (3) the annular stenosis 4 to 7 cm. from the bladder due to traction and kinking from the peritoneal suture after radical operation; and (4) the radiogenic sclerosis of the ureteral wall in rare cases.

The danger of this complication is its asymptomatic beginning and the mistake of attributing it to malignant extension. It is usually not recognized until infection or uremia set in, and urologic investigation should be mandatory in all cancer cases. The indications for operative treatment depend on the need to delay the onset of uremia, the possibility of curable benign disease, the age and condition of the patient, and location of the stenosis. The different operations include: nephrostomy or ureterostomy in cases of pre-existing involvement or pyelonephritis; transrenal fistula, which is lifesaving in anuria and reversible; neoureterocystostomy, which requires undamaged tissues and the avoidance of tension; the Boari plastic operation, with a bladder-tube replacing the diseased ureter; and the ileal pouch, ureteroileocystostomy. Results were reported as encouraging in 9 cases.

—W. Dieter Bergman, M.D.

Cervical Carcinoma: Growth and Spread and Some Adjunctive Therapeutic Measures. A. W. Diddle, K. A. O'Connor, and H. H. Jenkins. *Am. J. Obst.*, 1961, 81: 166.

Five hundred and five women with invasive cervical carcinoma were treated at the Memorial Research Center and Hospital, Knoxville, Tennessee during a period of 10 years and 3 months.

Noninvasive carcinoma progressed to invasive cancer of the cervix in 3 patients over periods of time varying from 6 to nearly 14 years.

Epithelial neoplastic cells were identified in the circulating blood draining the tumor site of several women. Circulating atypical cells were found more frequently with the more advanced, endophytic growths than with exophytic lesions. It is hypothesized that distant metastases may arise by this route of spread.

It is important to provide nutritional care for cancerous patients during radiation treatment. Otherwise they may not be able to complete the therapy or they may succumb from complications produced by the radiation. Antibiotic therapy is used prophylactically during intracavitary radiation but not for external irradiation. It is believed that the disadvantages outweigh the advantages under the latter circumstance.

The ovaries were not removed from 10 women less than 39 years old who were treated by radical hysterectomy and bilateral pelvic lymphadenectomy for cervical cancer graded as International Stage I. This procedure is still considered experimental. In the younger woman ovarian conservation is of physical and emotional value. If the ovarian blood supply is preserved and the surface of the ovary is uninjured, it is believed that the gonads usually function normally.

Pelvic perfusion with nitrogen or phenylalanine mustard has been demonstrated to produce a radiomimetic effect on cervical cancer. However, the toxic effects of these drugs preclude their wide use.

—Alan Rubin, M.D.

The Role of Surgery in Carcinoma of the Cervix. Hoke Wammock. *J. M. Ass. Georgia*, 1960, 49: 591.

Over the past 10 years, 66 patients with carcinoma of the cervix were treated by a combination of intrauterine and intravaginal radium therapy followed within 4 weeks by radical hysterectomy and bilateral iliac lymph node dissection. Eleven patients with stage I disease were so treated and all are living and well over 2 years later. Of 12 stage II patients, 11 are living and well, 6 over 5 years later. Of 7 stage III patients who received roentgenotherapy and radium and could then have a radical hysterectomy and iliac node dissection, 2 are living and well, 5 and 8 years later, respectively. *—Alan Rubin, M.D.*

Optimum Radium Distribution in the Treatment of Cancer of the Cervix. P. R. Blahey. *Obst. Gyn.*, 1960, 16: 679.

Theoretical considerations established the optimum radium distribution patterns suitable for the treatment of cancer of the cervix.

Applicators are presented which were designed to integrate the desirable features by retaining the pattern of radium distribution with high precision, immobilizing the uterus to the midline, displacing vaginal and bowel walls to a controlled distance, and eliminating use of a vaginal pack.

Precision control of radium distribution patterns permits a direct transfer of isodose phantom studies to the studies of tissue dose intensities at any one or many areas of the pelvis at which such information is required. The same theoretical principles with identical radium distribution pattern and isodose charts are applicable to radioactive lengths of radium ranging from 0.5 cm. to 2.0 cm., provided that the radium units are of a uniform strength.

Intracavitary radium treatments for carcinoma of the cervix are easily integrated with external therapy without the necessity of detailed studies of each pattern of radium distribution by the radiophysicist. Precision control of radium distribution with fixed isodose curves provides a method by which to study the exact thickness of tissue between the radium units and adjacent visceral cavities by direct readings from these cavities and permits precalculated alterations in the desirable radiation dose.

Dosage charts for various radium distributions are given. *—Alan Rubin, M.D.*

Prevention of Fistulas and Lymphocysts in Radical Hysterectomy. Richard E. Symmonds and Joseph Hyde Pratt. *Obst. Gyn.*, 1961, 17: 57.

A technique is presented for complete peritonealization of the pelvis and closing or covering of the vaginal vault after radical hysterectomy and bilateral lymphadenectomy. Pelvic drainage by means of extraperitoneal suction catheters is suggested.

During the past year this procedure has been performed for 20 consecutive patients, many of whom previously had received extensive irradiation. There were no fistulas and no lymphocysts. During the same period, 18 patients composing a second group were treated by similar peritonealization of the pelvis but without the use of suction catheters. One lymphocyst and one vesicovaginal fistula developed in this group. The morbidity rate for both groups, totaling 38 patients, was only 45 per cent, which is considerably lower than that previously noted when drainage was provided through an open vaginal vault.

It is the authors' impression that the modifications presented will reduce the incidence of accumulations of fluid, pelvic infection, and tissue necrosis. Since the procedure provides additional protection for the denuded ureters, the base of the bladder, and the rectum, it is anticipated that the development of fistulas will be reduced.

Ultrastructures of the Normal and the Tumorous Human Endometrium (Ultrastructures de l'endomètre humain normal et tumoral). C. SIRTORI. *Bull. Soc. Roy. belg. gyn. obst.*, 1960, 30: 341.

AN ELECTRONMICROSCOPIC STUDY was conducted on endometrial biopsy specimens from 55 normal patients, 17 patients with adenocarcinoma of the endometrium, and 3 with adenoacanthoma.

The specimens from the normal human endometrium disclosed, in the folliculinic phase, the intercellular membranes forming straight lines, small microvillosities and desmosomes, small mitochondria, and a poorly developed endoplasmic reticulum. The luteinic phase displayed an intercellular membrane with interdigitations, long microvillosities, desmosomes, large, coarse mitochondria with radiating "cristae," a well developed, endoplasmic reticulum, and finely reticular cytoplasm in the region beneath the nucleus, in which histochemical examination disclosed masses of glycogen.

The results of this study show that in general the glandular cells of the normal and the pathologic endometrium in the human subject differ by the characteristics of the free surfaces and by the introflexions of the intercellular membranes. This abnormality has resulted in the hindrance to exfoliation of the glandular cells and serves to explain the poor results in the diagnosis cytologically of carcinoma of the endometrium by means of vaginal smears.

—*John W. Brennan, M.D.*

Endometriosis. WILLIAM V. CAVANAGH. *Bull. Sloan Hosp. Women*, 1960, 6: 115.

SIX HUNDRED AND FORTY-SIX CASES of external pelvic endometriosis have been reviewed with a report on the clinical and pathologic findings. It was noted that the hematomas in the patients under 30 years of age were distinguished by more rapid growth and larger size.

Ovarian hematomas are the hallmark of endometriosis. These palpable cysts, together with pelvic pain, dysmenorrhea, and the pattern of lowered fertility should make for frequent preoperative diagnosis. Pain may be completely absent in older patients, but in these patients in later life uterine bleeding is common because of additional pelvic disease. In the absence of pain and bleeding in these older patients some hematomas are discovered only at operation, being masked by the almost ever-present fibroids. Endometriosis is encountered in 7 to 10 per cent of women operated on for pelvic disease. Fully 18 per cent of these will be found in women under 30 years of age, and it was in these young patients that the enlargement of the cysts frequently was found to be rapid and fulminating. They presented themselves for examination with a short recent history of pelvic pain and were found to have large easily palpable cysts. Some of these were found in women not too long married or with a fairly recent history of parturition.

Pregnancy complicated by an ovarian endometrial hematoma is rare. In this series there were 14 such hematomas in 48,402 pregnancies during this 18 year period. Some of the cysts became clinically manifest fairly uniformly during the third or fourth month of pregnancy, resulting in acute pelvic pain with or without rupture of the cyst. In any case, exploratory operation was usually imperative, the pregnancy usually going on to term.

Because of the presence of the hematomas 80 per cent or more of these patients will come to surgery and in addition, because of the age and the frequent presence of complicating fibroids, only around 30 or 40 per cent will be suitable for conservative operation. It is sometimes impossible to identify or remove all the small implants or to recognize deep-seated ovarian lesions during such conservative surgery; hence, a recurrence rate of 26 per cent. But this is a calculated risk, for fertility is very often restored after operation.

The postoperative fertility pattern showed a resurgence in the immediate years after the operation, but only to about the same degree over-all as that noted in endometriosis in general.

—*John R. Wolff, M.D.*

Endometriosis (Endometriosis). MARTINIANO FERNANDES. *Gin. & Obst.*, Peru, 1960, 6: 13.

THE AUTHOR gave the opening discourse at the first Peruvian Congress of Obstetrics and Gynecology, basing his opinions and conclusions on the experience gained in the histologic study of specimens procured from 1,210 laparotomies.

On the whole the author regards all forms of endometriosis, including adenomyosis or endometriosis interna, endometriosis externa, and stromatosis, as essentially benign and therefore believes that the treatment should be as conservative as possible, particularly the surgical therapy in the young woman.

The treatment is essentially surgical. Irradiation therapy may be used for recurrences after operation and in the older patient who is approaching or has attained the menopause. However, the greatest attention should be allotted to the matter of prophylaxis. In accordance with the teachings of Sampson, the greatest care should be taken to avoid reflux of menstrual blood through the tubes by refraining from gynecologic examination during this period, by abstaining from curettage at the time of performing vaginal operations, and by correcting uterine deviations and cervical stenoses. Violent physical exercise

should be abstained from during the menstrual period. The immoderate administration of estrogens should be condemned in women with lesions suggestive of cancer and in young women who have already undergone conservative operation. In these younger patients operations for direct fixation of the retroverted uterus to the anterior abdominal wall should not be considered. In the salpingectomies the intramural section of the tube should always be excised. Finally, early marriages should be encouraged for the female and contraceptive measures should be forbidden. During operation, all suggestive areas of the peritoneum should be extirpated. —*John W. Brennan, M.D.*

End Results in Adenocarcinoma of the Endometrium Managed by Preoperative Irradiation. JOHN B. MONTGOMERY, WARREN R. LANG, DAVID M. FARELL, and GEORGE A. HAHN. *Am. J. Obst.*, 1960, 80: 972.

AT the Jefferson Medical College and Hospital in Philadelphia, Pennsylvania, the preferred method of treatment for adenocarcinoma of the endometrium has been the use of intrauterine radium followed in 6 weeks by total hysterectomy and bilateral salpingo-oophorectomy. In operable cases, irradiation, especially intrauterine radium, has been used primarily to devitalize carcinoma tissue and thereby prevent manipulative spread and local recurrence. The facts that preoperative radiation has resulted in complete destruction of the cancer in more than one-half of the patients and that local vault recurrences have been rare demonstrate the value of this procedure. Harmful effects have been limited to a few cases of mild proctitis.

In an experience covering 34 years and involving 297 patients, it was possible to utilize this preferred method of treatment in 40 per cent of the cases. Of the patients so treated, 86.6 per cent have survived 5 years. The remaining 60 per cent of the patients were treated less satisfactorily, usually because of advanced disease or poor operative risk. The value of irradiation is brought out by this second group. For example, those patients receiving cancerocidal doses of radium alone had a 5 year survival rate of 60.8 per cent. If irradiation can increase the salvage of patients even a small percentage beyond that which might be expected with operation alone, its use is justified.

—*Lester T. Hibbard, M.D.*

Ovarian Function Following Pelvic Operation. RICHARD W. TELINDE and LAWRENCE R. WHARTON, JR. *Am. J. Obst.* 1960, 80: 844

THE EFFECT of removal of the uterus on the ovary and its function is still a controversial subject.

This study was undertaken because of a renewed interest in the fate of the ovary after hysterectomy and in postmenopausal ovarian function. Six female monkeys, 5 *Macaca irus* and 1 *Macaca rhesus*, were used because they have cyclic menstruation. The following procedures were performed: tubal ligation, salpingectomy, section of tube and utero-ovarian ligament, subtotal hysterectomy, and total hysterectomy. These procedures were followed by laparotomies, FSH determinations, and, ultimately, autopsy.

No sign of impairment of ovarian function was noted as evidenced by derangement of follicular or corpus luteum development, maturation, or regression, nor were there any detectable ovarian stromal changes.

The authors state these experiments do not afford any basis to support the indiscriminate removal of ovaries in younger women during a hysterectomy.

—*Lawrence Bernard, M.D.*

The Stein Leventhal Syndrome (La sindrome di Stein Leventhal). A. BOMPIANI and G. MATTIOLI. *Ann. ostet. gin.*, 1960, 82: 959.

IN 1954 and 1955, 23 cases of Stein-Leventhal syndrome were studied at the Obstetric and Gynecologic Clinic of the University of Milan Medical School, Italy. The syndrome is characterized by amenorrhea, sterility, adiposity, and hirsutism and is most frequently seen in young women. The main pathologic feature is the presence of bilateral polycystic transformation of the ovary. The pathogenetic mechanism of the disease is the object of much debate among the various investigators, but recent experiences seem to indicate that increased production of follicle-stimulating hormone may play an important role.

In this study particular attention was devoted to the biochemical features of the syndrome and each patient was subjected to an extensive series of hormonal determinations. Thus the different fractions of the 17-ketosteroids were determined by means of chromatographic methods, both before and after gonadotropin and prednisone therapy, in 22 patients. The following results were obtained: 13 showed values lower than 12 mgm. for 24 hours, 4 showed values between 12 and 20 mgm., and in the remaining 5, the excretion was higher than 20 mgm. After treatment with gonadotropin and prednisone an increase of these values was noted in 4 of the 12 patients studied. It is of interest to note that in 1 of the patients so treated there was a sudden increase in size of the ovarian tumor previously present, with abdominal pain and distention. The tumor promptly subsided, however, on discontinuation of the drugs. Sixteen patients underwent surgical treatment which consisted of wedge resection of both ovaries with excision of at least one-third of the glandular tissue on each side. The remaining 7 patients were treated medically. The results of the surgical treatment were poor, since in only 4 patients a slight improvement was observed and the clinical picture was completely unchanged in the remaining 12.

—*Maria Serratto, M.D.*

Polycystic Ovarian Disease. TOMMY N. EVANS and GARDNER M. RILEY. *Am. J. Obst.*, 1960, 80: 873.

FORTY CASES of polycystic ovarian disease, Stein-Leventhal syndrome, were observed at the University of Michigan Medical Center, Ann Arbor, since 1950. The age distribution was 17 to 40 years and all of these patients had in common oligomenorrhea or amenorrhea, infertility, and infrequent or absent ovulation. All had normal excretory rates for estrogen and gonadotropin. The 17-ketosteroid levels were normal or slightly elevated. In those cases tested, pregnanetriol values were all within normal limits. Pregnanediol levels were comparable to those found during the follicular phase of a normal menstrual cycle.

In 2 patients luteinizing hormone excretion was comparable to that found in 3 normal patients during preovulatory and postovulatory phases. A third patient had slightly greater luteinizing hormone levels.

After the preliminary endocrine investigation, all patients were subjected to bilateral ovarian wedge resection, which resulted in ovulatory cycles in 36. Thirty-seven pregnancies occurred in 21 patients. Three were operated on too recently to evaluate restoration of ovulation. Among those who have not conceived, 10 were operated on during the past year, 2 are unmarried, and 1 has an oligospermic husband.

Two had had previous ovarian wedge resections elsewhere and 1 of these has now conceived twice since the second operation. Two of the patients who ovulated after operation have since reverted to their original status, the cause of reversal being unknown.

The ovaries of all but 1 were grossly typical of changes ascribed to the Stein-Leventhal syndrome.

Because analysis of the clinical and laboratory data did not identify the basic mechanism of production of polycystic ovaries, the authors produced cystic ovaries experimentally in rats by several methods which permitted continuous exposure of the ovaries to follicle-stimulating hormone without sufficient luteinizing hormone for ovulation and luteinization. The collation of the clinical and experimental findings suggests that the Stein-Leventhal syndrome is but a part or phase of the over-all problem of anovulatory ovarian function. —*Lawrence Bernard, M.D.*

Ten Years' Experience with Operative Treatment for Ovarian Disease at the Department of Obstetrics and Gynecology of the University of Rome Medical School (Dieci anni di interventi per patologia dell'ovaio nella clinica ostetrica e ginecologica dell'Universita' di Roma). L. ZICHELLA and M. BARBERI. *Clin. ostet. gin.*, 1960, 62: 296.

THE AUTHORS have made a statistical analysis of 870 cases of ovarian neoplasms, 579, or 66.5 per cent, of which were cysts, 172, or 19.8 per cent, were benign solid neoplasms, and 119, or 13.7 per cent, were malignant tumors. The incidence of malignant ovarian neoplasms per year has been constant with the exception of 1951 to 1953 when an incidence lower than normal was encountered. On the other hand, an unusually high incidence was observed in the year 1954. Among the benign tumors, 8.2 per cent of the cystoadenomas, 11.9 per cent of the dermoids, and 11.1 per cent of the fibroadenomas were bilateral, whereas 39.4 per cent of the malignant forms were bilateral.

The relationship between ovarian disease and pregnancy was considered. In 2.9 per cent of the ovarian cysts there was an associated early normotopic pregnancy and in 3.7 per cent a tubal pregnancy. Among the malignant tumors, dermoids were associated with the highest incidence of pregnancies, with a percentage of 11.9. Analyzing the incidence of sterility in patients with different forms of neoplasms, it was noted that 23.2 per cent of the women with cystoadenomas, 26.8 per cent with dermoids, and 23.5 per cent with carcinomas were sterile.

The distribution among age groups was as follows: between 21 and 50 years of age, cysts and dermoids were the most frequently encountered tumors. Between 21 and 60, cystoadenomas and other benign types of tumor were the most frequent, whereas between 41 and 60, carcinomas and other malignant tumors were the most frequent. Regardless of the nature of the neoplasms, the highest incidence of ovarian tumors was observed in the third decade of life. Fifty per cent of the patients with malignant neoplasms were inoperable. In concluding the article, the authors stress the point that all women beyond age 30 should undergo periodic medical check-ups.
—*Maria Serratto, M.D.*

Equilateral Distribution of Ovarian Tumors. H. K. FARRAR, JR., and R. BRYAN. *Am. J. Obst.*, 1960, 80: 1085.

A MORE FREQUENT OCCURRENCE of ovarian neoplasms in the left than the right ovary has been suggested by several investigators. On the basis of such data, the prophylactic removal of the left ovary at the time of hysterectomy in premenopausal patients has been proposed as a means of decreasing the incidence of subsequent ovarian tumors and still avoiding castration. If, indeed, tumors involving the left ovary could be shown to be statistically more frequent, there might be merit in routine prophylactic left oophorectomy in premenopausal patients at the time hysterectomy is performed. Such a procedure would then offer a significant reduction in the incidence of further ovarian neoplasms while maintaining a good portion of the major source of estrogen.

Accordingly, the authors reviewed all of the material in the files of the laboratory of the Department of Obstetrics and Gynecology of Northwestern University Medical School, Chicago, Illinois. Follicle, corpus luteum, germinal inclusion cysts, and metastatic lesions were eliminated. Cystomas were included only when there was a clearly serous or mucinous epithelial pattern in a unilocular cyst. All other ovarian tumors were evaluated except those occurring in patients with a history of previous oophorectomy.

Neither the series of the authors, comprising 862 ovarian tumors, nor the somewhat smaller series of Siddall and Levine and Grimes and associates could be shown to contain a statistically significant increase in the number of tumors involving the left ovary over the expected value of 50 per cent. The authors conclude with two rather emphatic statements:

1. There was no statistical difference in the number of cases involving the left and right ovaries.

2. There appears to be no advantage in removal of one ovary over its opposite as a means of further decreasing the incidence of subsequent ovarian tumors. —*T. W. McElin, M.D.*

Bilateral Brenner Tumors of the Ovary. H. K. FARRAR, JR., and R. R. GREENE. *Am. J. Obst.*, 1960, 80: 1089.

BRENNER TUMORS are being reported with increasing frequency, but bilateral Brenner tumors are relatively rare. The authors report 2 cases in which Brenner tumors were present in each ovary. These 2 case reports make an approximate total of 29 instances of bilateral Brenner tumors that have been reported. In the first case reported by Farrar and Greene, the

bilateral Brenner tumors were similar in appearance and of ovarian stromal origin.

In the second case reported there were apparently a mucinous cystadenoma and 2 separate Brenner tumors in the left ovary and 3 Brenner tumors in the right ovary. The word "apparently" is used because serial blocks of the ovaries were not obtained. In the left ovary there was an area in a Brenner tumor where a cystic cavity was lined in part by mucinous and in part by Brenner epithelium.

Slightly more than 400 Brenner tumors have been reported in the literature and the incidence of bilaterality appears to be in the neighborhood of 7 per cent. This figure of bilaterality is undoubtedly somewhat high since bilateral Brenner tumors are of more interest and would tend to be reported, whereas the unilateral variety might be ignored.

—*T. W. McElin, M.D.*

EXTERNAL GENITALIA

Lymphatics of the Vulva. E. Parry-Jones. *J. Obst. Gyn. Brit. Empire*, 1960, 67: 919.

Lymphatic vessels from the vulva do not cross the labiocrural fold at any point to reach their termination in the inguinal and femoral nodes. They travel along the length of the labia. Lymph flows readily from the labia minora to the labia majora but not from the labia majora to the labia minora. It also flows readily from the labia minora to the vestibule but not from the vestibule to the labia minora. The lymphatics from the vestibule run alongside the clitoris or to the posterior part of the labia majora.

The lymphatics from the perineum travel either immediately outside the vulva or along the labia majora. The lymphatics of the skin immediately adjacent to the vulva go into or parallel with the labiocrural fold. There is no evidence for or against contralateral or retrograde spread.

The findings of this investigation confirm that the operation for carcinoma of the vulva should consist of inguinal and femoral lymphadenectomy together with vulvectomy. The vulvectomy incision should skirt the vulval boundary except in cases in which the growth encroaches on the labiocrural fold or involves the perineum.

The lower portion of the urethra should be removed not only when it is involved by growth but also when the growth involves the labia minora. Primary closure of the wound is possible in most cases.

—*John R. Wolff, M.D.*

Utilization of the Foley Catheter in the Surgical Treatment of Vesicovaginal Fistulas (Utilisation de la sonde de Folley dans la cure chirurgicale des fistules vésico-vaginales). Paulo Barros. *Gyn. prat.*, 1960, 11: 383.

Barros, a Brazilian gynecologist, has been using the Foley catheter in his technique of fistula repair since 1949. The Foley catheter is inserted through the fistulous aperture and is then inflated. This procedure dispenses with all other forceps, except a tenaculum to pull the uterine cervix downward. The fistula is elevated and a transverse incision is made through the vaginal mucosa in the fold of the anterior vaginal fornix. This transverse incision is followed by a vertical mucosal incision which passes upward from it, an inverted T incision, surrounding the fistulous aperture and thus marking out a cuff of vaginal mucosa around the defect. The cuff is now dissected up and the bladder further extensively mobilized from the edges of the incision, the mobilized flaps being held back by guy sutures.

Next a chromic catgut purse string suture is used to approximate the wound edges of the cuff to the stem of the catheter. The catheter is deflated and removed and the purse string suture tied firmly in a triple knot; the ends of this suture serve as a guy while the second purse string suture is applied, thus burying the first. A few interrupted catgut sutures are then applied to the contiguous bladder wall and the entire operative wound is finally closed by colporrhaphy. Drainage of the bladder with a Foley catheter, instillation of antibiotics into the bladder, and other postoperative care are utilized in the customary manner.

—*John W. Brennan, M.D.*

PREGNANCY AND COMPLICATIONS

The Prognostic Value of Vaginal Cytology in Pregnancy. Robert E. L. Nesbitt, Jr., Rogelio Garcia, and Doris S. Rome. *Obst. Gyn.*, 1961, 17: 2.

Many of the primary causes of perinatal casualties are related to endocrine disturbances. The functioning quality of the endometrium and later the decidua may decide the fate of the embryo and fetus by affecting the development of the chorion.

A well-developed placenta will produce and secrete adequate amounts of estrogen and progesterone. These hormones maintain the decidua and insure proper metabolic processes essential for fetal growth. The present concept of the hormonal control of pregnancy in the human regards progesterone as the dominant hormonal factor responsible for maintenance of pregnancy.

Since hormonal activity is one of the essential activities influencing the behavior of vaginal epithelium, the general cytologic pattern of the vaginal smear reflects not only the hormonal status of the female sex glands but also any functional disorders of the genital tract.

Cytologic evaluation of the vaginal epithelium may be used as a prognostic tool in screening patients for endocrine dysfunction. The cells of the vaginal epithelium respond early and more sensitively than any other easily accessible site of the genital tract. It is often possible to perceive the slightest changes in the vaginal epithelium due to hormonal inadequacy before these are detectable by quantitative hormonal analyses.

Specimens were collected containing undisturbed epithelial cells from a midvaginal scraping. Vaginal examinations, coitus, douches, or local treatments were avoided for at least 24 hours before the collection of the smears. The Papanicolaou staining technique is satisfactory for morphologic interpretations, however, the hematoxylin-Harris-Schoor technique has been found to give the best results for hormonal evaluations because of reliable and essentially constant staining reactions.

The vaginal smear for cytohormonal diagnosis should become an integral part of the physicians' armamentarium. It is a practical screening technique for determining the end effects of the combined vaginal action of estrogens and progesterone. It is a highly accurate method for forecasting pregnancy outcome and for testing the efficacy of the therapeutic regime.

The procurement and study of vaginal smears obtained weekly during the critical months of early pregnancy will provide an effective means of testing the efficacy of therapeutic hormone regimens and of forecasting the ultimate outcome of pregnancy.

—Harry Fields, M.D.

The Elimination of the Urinary Corticoids During Pregnancy (L'elimination urinaire des corticoïdes au cours de la grossesse). A. J. BRET, COIFFARD, and CRIMAIL. *Rev. fr. gyn. obst.*, 1960, 55: 669.

EIGHT HUNDRED determinations of the corticoids in the urine were made on 719 pregnant women.

In the course of physiologic gestation the average amount of the glucocorticoids in the urine is 5 mgm., slightly higher than the 4 mgm. of nonpregnant women. The graph line of the glucocorticoids runs slightly below the base line of 5 mgm. for the first half and slightly above this line for the second half. In the presence of gravidic nephropathy these values are increased by 35 per cent above the 5 mgm. average. In the perigravidic metabolic disturbances, that is, diabetes, with the result of the oval test for hyperglycemia greater than 2 gm. per liter, and paradiabetes with test results of 1.60 to 2 gm. per liter, the corticoids increase from 30 to 50 per cent. The disorder is especially evident in women whose body weight has notably increased during the course of the gestation and surpasses 30 per cent of the ideal weight.

On the whole, the variations of the 17-hydroxycorticosteroids, as measured in the urine by the method of Porter and Silber, are relatively slight. The authors do not believe that their results give any support to the theory of a gestational hypercorticoidism, but that they suggest rather the presence of a dyscorticoidism in which certain components are hindered in their transformation into their derivative substances.

—John W. Brennan, M.D.

Prenatal Care and the Frequency of Pre-eclampsia (Praeeklampsiehaeufigkeit und Schwangerenbetreuung). K. A. HÜTER. *Deut. med. Wschr.*, 1960, 85: 1788.

TOXEMIA has recently become the most important medical problem in modern obstetrics. The author has seen 522 cases of pre-eclampsia during a 15 month period from 1958 to 1959 at the Women's Clinic, Düsseldorf, Germany. This constitutes 16.5 per cent of 3,154 deliveries, and pre-existing cardiovascular or renal disease was postulated in one-quarter of the cases. Eclampsia occurred in 3 instances.

The criteria of diagnosis used were those of Dieckmann, and blood pressure elevation was found to be present in 72.4 per cent, edema in 43.1 per cent, and proteinuria in 18 per cent of the cases. There were no maternal deaths, and neonatal mortality decreased from 15 per cent in 1930 to 3.8 per cent in 1959 (0.19 in light cases). Prematurity was present in 63 per cent of the infants. The author believes that this improvement is the result of greatly improved prenatal care. Nearly 40 per cent of all patients delivered had been seen in the Advisory Clinic during pregnancy where one-quarter of them were found to have signs of pre-eclampsia. The author is strongly in favor of prenatal care for maternity patients, including regular visits, weight control, and special dietary advise in the presence of toxemia.

—W. Dieter Bergman, M.D.

Indicated Termination of Late Pregnancy. HARRY FIELDS, JOHN W. GREENE, JR., and FRANKLIN L. PAYNE. *Obst. Gyn.*, 1961, 17: 30.

WHEN the termination of late pregnancy is indicated, two methods are available: cesarean section and the induction of labor. Formerly, cesarean section constituted the usual procedure. Recently, improvements in technique that increase the safety and reliability of induction have made this latter method of termination worthy of serious consideration. The present study, based on 445 indicated terminations of late pregnancy, was made in an effort to define the circumstances under which induction of labor would be effective. All of the pregnancies were of 28 or more weeks, and the infants weighed more than 1,000 gm. and were all alive at the time of decision. Of the total number, 270 were terminated by induction and 175 by cesarean section.

The indications for termination were grouped in three categories: (1) systemic obstetrical: progressive toxemia, blood incompatibility, and prolonged pregnancy; (2) local obstetrical: placenta previa, placenta abruptio, and fetal distress; and (3) medical complications: diabetes, cardiac or renal disease, and certain miscellaneous medical conditions.

In the first category, the perinatal mortality was 1.4 per cent after induction and 19 per cent after cesarean section. For the second group, the induction perinatal mortality was 21 per cent and 12.8 per cent after section. For the third group, the infant mortality was 0 per cent after induction, and 4.2 per cent after section. These figures suggest that induction has a definite place in the problem of indicated termination of pregnancy, in the first and third categories, provided there is individualization of each problem. In the second group, the balance is in favor of cesarean section usually, but induction of labor may be preferable in certain instances.

In the first category, induction should be attempted in toxemia of pregnancy after medical treatment has stabilized or failed to improve the general condition. There should be no sign of fetal distress, and the toxemia must not be fulminating. In blood incompatibility, when consultation with the serologist suggests that the prolongation of pregnancy increases the hazard to the infant, termination by induction should be the method of choice. Induction may be utilized in prolonged pregnancy when local factors are optimum and there are no apparent signs of fetal distress.

In the second category, the choice of method of termination is frequently difficult. Each situation must be carefully evaluated, since results with induction are not comparable to those in other categories. Induction may be considered in partial or marginal

placenta previa, in multiparas who have not bled excessively, and when the fetus is of adequate size. In mild or moderate placental abruption with no evidence of afibrinogenemia and no fetal distress, induction may be undertaken. Should fetal distress or progression of the abruption develop, immediate delivery is imperative. Fetal distress should never be considered an indication for induction of labor.

In the third category, medical complications are best solved by induction of labor. In diabetes, it is frequently desirable to terminate pregnancy at the thirty-sixth to thirty-eighth week. Induction is an ideal method when maternal and fetal condition permit. Several days of ripening an unfavorable cervix may be spent in further stabilizing the maternal diabetes. When other medical conditions complicate pregnancy, termination by induction is desirable since this procedure is less detrimental to both the pregnancy and the existing medical disease.

Analysis of the results in two 5 year periods showed the induction rate at the Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania to have increased from 86 per cent to 91 per cent in the first group, from 4.3 per cent to 26.6 per cent in the second group, and from 52.5 per cent to 71.9 per cent in the third group.

Study of the perinatal mortality in the two 5 year periods reveals a reduction in the induction group, whereas the rate has remained the same for cesarean section. This indicates that there was a more careful selection of candidates for induction in the latter period and that the more severe indications were, therefore, concentrated in the cesarean group, particularly in the second category.

The authors conclude that induction has a place in the indicated termination of late pregnancy provided that the indications for the termination are carefully considered and each problem is individually studied before a method is undertaken. If induction fails, subsequent cesarean section is not harmful as judged by maternal morbidity and fetal mortality.

Clinical Study of Hypertensive Disease in Pregnancy. Benjamin Tenney and Robert V. Dandrow. *Am. J. Obst.*, 1961, 81: 8.

Essential hypertension is not a serious complication of pregnancy. Pre-eclamptic toxemia is largely preventable in normal pregnant women and in those with essential hypertension. Restriction of sodium is the basic prophylaxis. Rapid or excessive weight gain must be eliminated to prevent the development of pre-eclamptic toxemia. Renal disease is a most serious complication with a poor fetal salvage. Signs of impending renal failure are the indication for immediate delivery. Premature labor and/or fetal death in utero is a frequent result of renal disease in pregnancy.

—*Charles Baron, M.D.*

Management of Carcinoma of the Cervix in Pregnancy. A. F. Lash. *Obst. Gyn.*, 1961, 17: 41.

The management of carcinoma of the cervix complicated by pregnancy depends on the stage of the disease and of the pregnancy at which the disease is diagnosed. Good prognosis results from immediate comprehensive therapy.

The author reports his experience with 16 cases of cervical cancer complicated by pregnancy, of which 15 were stage I and 1 case was stage IV. There were 3 deaths and 13 survivals at the time of writing. Only 1 of the 3 patients who died had been treated by surgery as a primary modality.

The importance of routine cytologic studies in pregnant women is stressed in order to assure early diagnosis. The need to examine all pregnant women who bleed is underlined for the same reason.

The author believes that patients in the first two trimesters of pregnancy with disease no more advanced than stage IIa should have immediate radical hysterectomy and pelvic lymph node dissection. Should the nodes be found positive, postoperative roentgenotherapy should be used. Should this extent of the disease be present during the third trimester, cesarean section and immediate radical operation, as described, should be performed.

If the extent of the disease is greater than stage IIa, early comprehensive radium and roentgenotherapy is indicated, except for lesions that are radioresistant. In the latter case, surgery must be used and eviscerating procedures may be necessary.

—*M. Leon Tancer, M.D.*

Influence of Surgical Intervention on the Course of Pregnancy (Sull'influenza di interventi operatori nel corso della gravidanza). Silvio Bettocchi. *Clin. ostet. gin.*, 1960, 62: 253.

In order to study the influence of surgical intervention on the course of normal pregnancy, the authors reviewed the case histories of 101 patients operated upon for different reasons at the Obstetric and Gynecologic Clinic of the University of Rome Medical School, Italy, during the period 1946 to 1958. The series included 36 appendectomies, 34 excisions of ovarian tumors and cysts, 14 resections of uterine myomas, 4 procedures for correction of retroversion of the uterus, and 13 miscellaneous procedures.

Of the 101 operations performed, 97 were performed between the first and the sixth month of pregnancy and the remaining 4 in later periods. In 12 cases, or 11.9 per cent, operation was followed by abortion or premature labor. There was no relationship between the extent of the operation and course of the pregnancy, but an unfavorable influence on the pregnancy was exercised by surgery when the operation was performed on the ovaries, possibly because of interference with the function of the corpus lutem. In concluding the article, the author emphasizes that whenever an operation is indicated, pregnancy "per se" does not represent a contraindication.

—*Maria Serratto, M.D.*

Abnormalities of Coagulation in Obstetrics (Die Koagulopathien in der Geburtshilfe). H. Runge and P. Pfau. *Münch. med. Wschr.*, 1960, 102: 1949.

Maternal death from hemorrhage is seen much less commonly than previously. When obstetric hemorrhage does occur, provided there is no uterine atony or genital tract laceration, it may be uncontrollable even with massive blood transfusions. Such deaths are often caused by a defect in blood coagulation resulting from partial or complete depletion of circulat-

ing fibrinogen. This condition has been attributed to two possible causes: the entrance of tissue thromboplastic substances into the circulation producing a diffuse precipitation of plasma fibrinogen, leaving the blood incoagulable, or the presence of fibrinolytic agents in the blood stream which prevents the formation of adequate fibrin clot.

This syndrome of defective coagulation can occur with premature placental separation and intrauterine death of the fetus in the later months of pregnancy. In such cases the uterus should be emptied as soon as possible to prevent the occurrence of hypofibrinogenemia. Shock must be combated promptly and transfusions administered. Human fibrinogen is recommended as specific therapy.

Hypofibrinogenemia rarely occurs after normal births. The mechanism is poorly understood but is probably related to the two general mechanisms mentioned. The authors report the case of 1 patient who recovered.

Amniotic fluid embolism from particulate matter in the amniotic fluid is also associated with hypofibrinogenemia. Since amniotic fluid has coagulant properties it may produce intravascular clotting. If this occurs, fibrinogen is consumed and the blood then fails to clot normally.

Febrile missed abortion is another cause of hypofibrinogenemia. Death in such cases is thought to be related to a Sanarelli-Schwartzman phenomenon. The authors administered heparin in 2 cases and 1 of these patients succumbed. The rationale for the use of heparin is that it inhibits activation of the clotting systems in both the patient's blood and the transfused blood. —*Warren R. Lang, M.D.*

Report of 80 Cases of Rupture of the Uterus. Nirmala Swami and Thakor V. Patel. *J. Obst. Gyn. India*, 1960, 11: 63.

In rural India, rupture of the pregnant uterus is quite common because of a low level of obstetric care which features forceful manipulations and large doses of oxytocic drugs. At the Shree Sayaji General Hospital in Baroda, India, 95 per cent of patients with rupture are referred from the surrounding villages. All patients are grossly infected, the majority are in poor condition as the result of blood loss, and at least 10 per cent are moribund. Among 80 patients, only 7 had previously been delivered by section. Twenty cases were the direct result of injudicious use of oxytocics. The remainder had some variety of obstructed labor.

Experience has proved that the best treatment for this poor risk group of patients is repair of the laceration rather than hysterectomy. Of 67 lower uterine segment lacerations, 13 of the corpus, and 1 of the vaginal, 70 were treated by suturing and 8 by subtotal hysterectomy. The maternal mortality was 30 per cent as contrasted to the immediately previous period during which a policy of hysterectomy in all cases produced a 100 per cent mortality. Of the deaths, only 3 were due to infection. One-half of the patients were not sterilized by the operation and 3 have subsequently borne living children, 2 of them by cesarean section and 1 by vagina.

—*Lester T. Hibbard, M.D.*

Use of the 6-α-Methyl-17-α-Hydroxyprogesterone Acetate in Obstetrics (Attuali orientamenti sull'impiego del 6-α-metil-17-α idrossiprogesterone acetato in campo ostetrico). Luigi De Cecco. *Ann. ostet. gin.*, 1960, 82: 1137.

After a short review of the research work carried out in the field of synthetic progestative substances, which have proved effective in obstetrics, the author discusses the characteristics of the 6-α-methyl-17-α-hydroxyprogesterone acetate and presents his personal experience with this synthetic progestative.

Seventy patients with threatened abortion and 29 with threatened premature labor were treated with this drug. The hormone was administered orally in a daily dose of 20 mgm. when combined with estrogens, and in a dose of 30 to 40 mgm. a day when given alone. The hormone was administered in full dosage until the disappearance of all symptoms and signs and then administered in increasingly smaller amounts until it was discontinued. With this therapeutic scheme, positive results were obtained in 89 per cent of the 70 patients with threatened abortion and in 66 per cent of the 29 patients with threatened premature labor. No side effects were noted either in the mother or in the newborn.

—*Maria Serratto, M.D.*

Treatment of Placenta Previa (Die Behandlung der Placenta praevia von 1950 bis 1959 an der Universitaets-Frauenklinik Greifswald). S. Kruschwitz. *Münch. med. Wschr.*, 1960, 102: 2547.

The author reports on the results of treatment in 63 cases of placenta previa which were observed in 13,660 births at the University Hospital of Greifswald, Germany between 1950 and 1959. The over-all incidence of this obstetric complication was 0.46 per cent which is about midway between the values stated in the literature. The ages of the women were somewhat above the average age given for other series. Twenty and six tenths of the women were primiparas and 79.4 per cent were para III. A slight increase in the incidence of multiple births—3.1 per cent—was noted. Bleeding in the second half of pregnancy was the leading symptom but 25.4 per cent did not bleed at all. Anomalies of position were encountered in 14 cases, 12.3 per cent being transverse. The total infant mortality rate was 35.5 per cent, the corrected rate being 16.1 per cent. In contrast to this, the mortality rate for the mothers was 0 per cent.

In the first 5 year period of the decade reported on, the abdominal cesarean section delivery was performed in 70 per cent of the cases and in the following 5 years in 93.4 per cent of the cases; parallel to this, there was a decrease in the infant mortality rate from 45.1 per cent to 26.4 per cent. From this fact the conclusion is made that the abdominal cesarean section should be considered today as the method with the least danger for mother and child. For the sake of the immature child, the delivery by vaginal section should be selected as the most considerate type of delivery when there is a heavy loss of blood on the part of the mother. In suitable situations, an attitude of waiting should be taken more frequently in cases of nonviable children, provided the blood is replenished persistently. Such an attitude would de-

crease the high mortality rate among premature births. —*Andrew P. Adams, M.D.*

The Influence of Puberty and Pregnancy on Growth of Endemic Goiter (Ueber den Einfluss von Pubertaet und Schwangerschaft auf das Wachstum des endemischen Kropfes). H. SAUER. *Münch. med. Wschr.*, 1960, 102: 1959.

GOITER is still a problem in Austria. The majority of cases occur in females. Patients usually state that the goiter has been present since childhood or that it is related to the onset of puberty or to a previous pregnancy. The causes of goiter may be divided into two groups: true causes, of which iodine deficiency is the most significant; and manifest factors, such as growth, gravidity, cold, and other states which increase the thyroid hormone requirements of body tissue. The author analyzes the effect of puberty, pregnancy, and the climacteric on the development of goiter.

The charts of 2,135 patients operated upon for the first time for nontoxic goiter during the years 1952 to 1959 were reviewed. The indications for operation were medical rather than cosmetic. Twenty-one per cent of those operated upon were male and 79 per cent female. The average age was approximately 39 years for both groups. The occurrence of goiter is related to parity since with increasing number of children, the average age at the time of thyroidectomy increased as did the percentage of women in whom goiters developed. A review of the ages at which goiter occurred disclosed an increase at puberty and at the time of the menopause.

Prophylaxis of goiter consists in the administration of adequate iodine, usually in the form of iodized salt. If iodine is to be taken individually for prophylaxis, potassium iodide is the preparation of choice.

—*Warren R. Lang, M.D.*

LABOR AND COMPLICATIONS

Intravenous Infusion of Oxytocin (Die intravenoese Oxytocin-Infusion). K. SAAMELI. *Deut. med. Wschr.*, 1960, 85: 1791.

SINCE THE INTRODUCTION of the intravenous oxytocin infusion by Page in 1943 and the pioneering studies by Theobald, a vast interest in this drug has arisen all over the world. About 90 important articles on this subject have been published during the past few years. The author abstracts the current thinking on this substance with regard to its origin, effect, and destruction and the role of vasopressin and oxytocinase.

Oxytocin apparently has a half-life of approximately 3 minutes, and this fact alone should make intravenous administration preferable. If intramuscular injection still gives fairly good results it must be assumed that uterine action has been triggered for a certain period, possibly by virtue of the Ferguson effect. Further disadvantages of intramuscular administration are the unpredictable absorption rate at a chance location, variability of absorption during labor, and the lack of correlation of dosage and response, especially in certain selected groups of patients. Absorption cannot be restricted once overdosage becomes manifest, and the intravenous application can avoid the steep rise and decline of the blood level, even though it is more cumbersome.

The routine at the St. Gallen Women's Clinic, St. Gallen, Switzerland includes early rupture of the membranes in cases in which the cervix is ripe and labor has to be induced or stimulated. If the cervix is not ripe, stripping of the membranes, digital dilatation, and ripening by oxytocin drip can be employed. The dosage used is discussed and generally follows the suggestions of Caldeyro-Barcia. Continuous presence of a midwife should be required.

Such dangers as uterine tetany, precipitate delivery, uterine ischemia, uterine rupture, and amniotic fluid embolism should be preventable with proper supervision. An increased incidence of operative deliveries can probably be blamed on the cause that made oxytocin medication necessary in the first place rather than on the use of oxytocin. An increase in postpartum bleeding can be avoided by continuation of the drip past the third stage of labor. The author does not think oxytocin in the presence of toxemia causes a significant elevation of the blood pressure.

—*W. Dieter Bergman, M.D.*

On the Use of the Malmström's Vacuum Extractor (Sull'impiego del vacuum-extractor di Malmström). ALDO BARICALLA. *Minerva gin.*, Tor., 1960, 12: 1110.

THE AUTHOR presents his experience with the Malmström's vacuum extractor used over a 2 year period at the Department of Obstetrics and Gynecology of the San Paolo Hospital of Savona, Italy. A total of 46 extractions were performed. Thirty of the patients were primiparas and 16 multiparas. In all 46 cases the pregnancy was at term. The following conditions were considered as an indication for the use of the extractor: (1) prolonged labor, 32 cases; (2) primary inertia, 6 cases; (3) maternal diseases, 5 cases; and (4) fetal sufferance of mild degree, 3 cases. In 33 instances the cervix was fully dilated, whereas in 13 the dilatation was incomplete, 7 to 8 cm. On 3 occasions the presenting part was in the superior strait, in 38 in the midpelvis, and finally in 5 in the inferior strait. Occiput presentation occurred in 42 instances and breech presentation in 4. In 12 patients episiotomy was performed. The maximum negative pressure used with the extractor was 0.7 kgm./cm.^{2} and this value was obtained in 10 to 15 minutes. The average extraction period was 11 minutes, the periods ranging from 4 to 28 minutes. Maternal complications were represented by 4 cases of vaginoperineal lacerations, 2 of which were of second degree. Neonatal complications were limited to 2 cephalohematomas.

In concluding the author stresses the usefulness of the extractor when labor should be assisted but immediate delivery is not necessary. The extractor, however, is not to replace the use of the forceps in its specific indications or the administration of pitressin for primary inertia. —*Maria Serratto, M.D.*

Blood Loss During and Immediately After Delivery. MICHAEL NEWTON, LOIS M. MOSEY, G. E. EGLI, W. B. GIFFORD, and C. T. HULL. *Obst. Gyn.*, 1961, 17: 9.

ONE HUNDRED relatively normal patients were admitted to the delivery suite of a university hospital and were studied for blood loss incident to delivery.

Alternate patients were given either 1 ml. synthetic oxytocin intramuscularly after the delivery of the placenta or no oxytocin. Thus, 50 patients received oxytocin and 50 did not.

The spectrophotometric method of measuring blood, specifically the acid-heme method, was chosen for use in the study. The mean blood loss on the delivery table for all patients was 339 ml. There were wide individual variations. Primiparas lost significantly more blood than multiparas. Women who had delivered 5 or more children previously lost significantly more blood than women who had delivered 1 to 4 children before. Multiparas who had had an episiotomy lost significantly more blood than multiparas who had sustained neither a laceration nor an episiotomy. The performance of an episiotomy increased the blood loss in multiparas by a mean amount of 153 ml.

The mean blood loss during the first hour after removal from the delivery table was 41 ml. for all patients. Multiparas lost significantly more blood than primiparas at this time. The importance of careful observation of patients after delivery is stressed by the fact that 9 women lost more than 100 ml. of blood at this time.

No significant differences were noted in blood loss on the delivery table or in the first hour after removal from the delivery table between women receiving synthetic oxytocin intramuscularly and those receiving no oxytocin. However, significantly more of those receiving no oxytocin required additional treatment to control excessive bleeding. —*Harry Fields, M.D.*

Fetal Bradycardia During Labor. JOHN J. SCIARRA. *Bull. Sloan Hosp. Women*, 1960, 6: 123.

CHARTS from 412 patients with documented fetal bradycardia were reviewed, covering a 3 year period. It was found that 78 per cent of the fetal bradycardias occurred during the second stage of labor, whereas 22 per cent occurred in the first stage of labor. Of this latter group, 43 per cent of the observed bradycardias were due to an obvious obstetric complication and were treated accordingly; the remaining patients with unexplained bradycardia were managed either by cesarean section or by observation and vaginal delivery, with the majority of the cesarean sections being performed when the cervix was less than 6 cm. dilated. In only 39 per cent of the cases of unexplained fetal bradycardia in the first stage of labor could a probable cause be determined, and in most cases this probable cause was associated with an unrecognized complication of the umbilical cord.

—*John R. Wolff, M.D.*

PUERPERIUM AND COMPLICATIONS

Generalized Postpartum Peritonitis (Considérations sur l'aspect actuel des péritonites généralisées postpartum). J. E. HOUEL, L. SCHEBAT, and P. WAHL. *Rev. fr. gyn. obst.*, 1960, 55: 733.

TODAY, one rarely reads of generalized puerperal peritonitis. The advent of antibiotics has caused a sharp decrease in its frequency and severity, but the always potential postpartum infection with its serious sequelae and the possibility of an antibiotic-resistant organism emerging should keep obstetricians ever vigilant against relaxing their methods of asepsis.

This report is a detailed clinicopathologic analysis of 29 cases of generalized puerperal peritonitis.

All of the cases but 2 were from unattended home deliveries. The majority of patients were admitted with the diagnosis of puerperal infection or, rarely, "acute abdomen." Three patients were admitted with the diagnosis of acute intestinal obstruction. Each of these diagnoses underlines a clinical aspect of generalized puerperal peritonitis.

Twenty-seven patients had the asthenic form of the disease. After a few days with progressive fever and diffuse abdominal pains, there followed a constant fever, tachycardia, vomiting, and diarrhea. The severe abdominal pains were vaguely localized; the abdomen was distended, without rigidity and often without muscle spasm. Percussion toward the epigastrium revealed hyperresonance, toward the hypogastrium, dullness. Bimanual examination revealed a subinvoluted tender and boggy uterus, a patulous cervical os, and a tender and bulging cul-de-sac.

The sthenic form was seen in only 2 cases and consisted of generalized abdominal rigidity which made laparotomy necessary for correct diagnosis.

The authors describe a third form which they call "masked peritonitis" in which routine antibiotic therapy causes amelioration of signs and symptoms.

All 29 cases discussed were cases of primary peritonitis except 1 in which a ruptured uterus was found.

Laparotomies were performed in all cases to determine the extent of disease. Hysterectomy was only rarely indicated. Colpotomy was abandoned as insufficient. As much pus as possible was aspirated and this was followed by lavage with saline. Large drains were placed in each paracolic gutter and maintained for the next 2 or 3 days. A tube was inserted in the closing incision for antibiotic instillation. No fistulas resulted from the tubes, which remained in place 3 to 4 days.

Medical management consisted of shock therapy with maintenance of fluid and electrolyte balance. Oxytetracycline was given immediately by intravenous drip, then whatever medication was indicated by sensitivity tests. Chloromycetin was regularly instilled into the abdominal cavity by way of the tube. Corticosteroids were added in particularly severe infections. In cases with many adhesions, chymotrypsin was given. Gastroduodenal suction was used as needed.

There was a gross mortality rate of 20.7 per cent which included even those found on admission to be hopeless. Five patients died at or just after operation of irreversible shock. A sixth died 6 weeks later because of progressive cachexia associated with an intestinal fistula and a vast sacral scar.

—*Roger E. Parenteau, M.D.*

Prolonged Lactation in the Congoese (L'allaitement prolongé ches la congolaise). M. JESPERS. *Bull. Soc. Roy. belg. gyn. obst.*, 1960, 30: 495.

STATEMENTS concerning their conjugal life and childbearing and child rearing experiences were sought from 644 native women of the Belgian Congo. All had borne a child at least 1 month before the examina-

tions. From the statistical material collected the author found that in 80 per cent of cases the postpartum duration of amenorrhea was prolonged beyond 4 months, as compared with the 4 month maximal duration of postpartum amenorrhea of European women. This period, however, in this 80 per cent of the patients did not last longer than 15 months.

The breast nursing of the child, on the other hand, lasted much longer, the average duration being 16.4 months. Normal sexual relations were resumed after the child had begun to walk and the menstrual cycle had reappeared, at about 4 months, and reimpregnation did not interfere with the continuation of the period of active lactation.

Each succeeding pregnancy increased the period of postpartum amenorrhea as did the period elapsing between impregnations, suggesting that the prolonged period of lactation was resulting in the woman's relative sterility.

From 95 wives of the employees of the mining society the author was able to procure vaginal smears. The general cytologic picture was a complex one. The greater part of the lactating period was dominated by progesteronic stimulation, estrogenic stimulation being subliminal in amount and duration.

The author concludes that in future studies a possible inhibition by the breast feeding function on the suprarenals and a consequent inhibition of the estrogen factor by these organs will have to be considered.

—*John W. Brennan, M.D.*

NEWBORN

Annular Pancreas as a Cause of Acute Neonatal Duodenal Obstruction. Daniel M. Hays, Edward M. Greaney, Jr., and James T. Hill. *Ann. Surg.*, 1961, 153: 103.

Annular pancreas, observed as a disease entity producing chronic or recurrent intestinal symptoms in adults or children has been frequently reported and several hundred cases have been described. Annular pancreas as a cause of acute duodenal obstruction in the newborn is much less commonly encountered. Among cases of neonatal intestinal obstruction, annular pancreas comprised less than 1 per cent of the total group and less than 5 per cent of those with localized duodenal obstruction.

Seven cases of acute obstruction of the duodenum in the neonatal period secondary to annular pancreas are described. Duodenojejunostomy was performed in 6 instances, with survival in 4. Three deaths were associated with complications attendant to the management of other major anomalies.

Analysis of the results of operative treatment in 40 collected cases of annular pancreas producing intestinal obstruction in the neonatal period suggests that: (a) operative dissection or division of the pancreatic annulus is contraindicated from both theoretical—embryological—and practical considerations; (b) duodenojejunostomy has proved a more effective "bypass" than gastroenterostomy; and (c) the association of this condition with esophageal atresia occurs with sufficient frequency to warrant the development of a plan of management of this dual condition, which has to date been uniformly fatal. A two stage procedure with initial esophageal anastomosis and secondary abdominal exploration seems advisable.

—*Ely Elliott Lazarus, M.D.*

Follow-Up and Critical Observations of Newborns Treated for Erythroblastosis in the Years 1947 to 1957 (Nachuntersuchungen und epikritische Betrachtung unserer in den Jahren 1947 bis 1957 behandelten Neugeborenen mit fetaler Erythroblastose). H. Lau and P. Pfau. *Med. Welt*, 1960, p. 2139.

During the period 1947 to 1957 at the University Women's Clinic of Heidelberg, Germany, there were 16,622 deliveries. Of 14,106 mothers on whom Rh typing was performed, 2,095 or 14.9 per cent were found to be Rh negative. Of 1,813 newborns of these mothers, 1,015 or 55.7 per cent were Rh positive. Eighty-six of the Rh positive newborns manifested erythroblastosis. An Rh related hemolytic process was found in 4.7 per cent of all Rh negative mothers and in 8.5 per cent of their Rh positive offspring.

During this same period there was 1 case of sensitization by the Kell factor and 5 from ABO incompatibility. Of the total number of pregnancies studied the total number of known blood incompatibilities occurred in 92 cases, 0.55 per cent.

Exchange transfusions are most valuable in the management of erythroblastosis. They should be utilized more frequently and as early as possible so that normal physical and mental development occurs. The use of single repeated transfusions should be reserved for anemia.

Forty-one children, erythroblastotic at birth, with an average age of 35 years, were investigated for physical and intellectual development. Analysis of these cases demonstrated that best results were obtained when exchange transfusions were performed, even if erythroblastosis was evident only serologically.

—*Warren R. Lang, M.D.*

SURGERY OF THE MALE REPRODUCTIVE SYSTEM

PROSTATE AND SEMINAL VESICLES

The Value and Advantage of Prostatic Cytology in Disease of the Urinary Tract (Valeur et intérêt de la cytologie prostatique en pathologie urinaire). R. GAYET, F. CABANNE, and J. BUTIN. *J. urol. med.*, Par., 1960, 66: 504.

A STUDY of material obtained by prostatic massage to establish the diagnosis of prostatic disease was carried out on the Urologic Service of the Regional Hospital Center and the Laboratory of Pathologic Anatomy of the Medical School of Dijon, France. After prostatic material is obtained by massage, it is put on slides and fixed with equal parts of ether and 95 per cent alcohol, then stained by the Harris Schorn technique.

In 62 patients examined, the following inflammatory lesions were found: 32 cases of prostatitis, 9 inflammations of the bladder neck, and 18 diverse conditions including epididymitis, cystitis, urethritis, and hemospermia.

The criteria for establishing a diagnosis of cancer of the prostate are the same as those of Papanicolaou, and the description of the cell types is given in detail. The article also contains illustrations of the different cells and cell types.

In 22 cases in which the clinical study, the acid phosphatase evaluation, and roentgenograms established the diagnosis, the prostatic smears were positive in 72 per cent.

The cytologic method of diagnosis of cancer of the prostate has shown proof of its possibilities, but the diagnosis of prostatic cancer should not rest upon the result of only one procedure.

—*Conrad A. Kuehn, M.D.*

A New Physiopharmacologic Treatment of Cancer of the Prostate (Nuovo trattamento fisio-farmacologico del cancro della prostata). O. FERULANO and F. PETRAROIA. *Minerva med.*, Tor., 1960, 51: 3586.

THE PREPARATIONS used were iontophoretic magnesium and a phytocolloid obtained from several varieties of algae—algasol-T.331. The magnesium ions were introduced transrectally into the prostatic tissues by means of a galvanic current every other day, optimally in sessions of 20 minutes each; the algasol-T.331 preparation was given in daily oral doses of 3 c.c. for 40 consecutive days. Ten patients were given the iontophoretic therapy, 10 were treated with algasol-T.331, and 10 were treated simultaneously with both preparations.

Nine patients who did not return for follow-up must be excluded from the assessment of the results. Only 1 patient did not receive any clinical benefit from the therapy. Two patients have recently died. One of these had skeletal metastases at the time of treatment and the other had chronic, complete urinary retention. The remaining 18 patients, or 85.5 per cent, are still alive and have received notable benefit from the treatment.

In general, the authors believe that this physiopharmacologic method of therapy for prostatic cancer arrests the development of the neoplastic process, and that this inhibition of evolution is more accentuated and more lasting than that achieved by other methods, since the neoplastic process is less malignant in type and the patient is treated earlier.

—*John W. Brennan, M.D.*

Surgery of the Prostate (Zur Prostatachirurgie). A. THELEN and V. HIEMEYER. *Langenbecks Arch. klin. Chir.*, 1960, 294: 700.

IN A SERIES of 500 prostatectomies, suprapubic transvesical prostatectomy was carried out in 325 patients and a transurethral resection was performed in 175 cases. The early expectation that transurethral resection of a good sized adenoma in a patient who was a bad surgical risk would result in a decreased mortality and morbidity was not substantiated and experience has shown that if the gland is quite large, the risk of an open prostatectomy is less than that of a transurethral resection.

In patients who have a bladder residual of less than 100 c.c. the operation is performed only when the patient has had recurrent attacks of urinary retention, frequent hemorrhages, or marked symptoms.

In 134 patients who had definite myocardial damage, prostatectomy was carried out after thorough preparation of each patient.

Intravenous pyelography is a good method with which to estimate the function of the kidneys. Azotemia was present in 41.5 per cent of the patients. Diabetes occurred 15 times. Vasectomy is not now carried out routinely because epididymitis has become a considerably less frequent complication. Patients who have urinary infection or a considerable elevation of the blood nitrogen are first treated by indwelling catheter drainage.

The mortality rate for the series of 500 prostatectomies amounted to 3.8 per cent.

A transfusion was necessary in 225 patients who underwent prostatic operation. After transurethral resection of the prostate severe postoperative bleeding occurred in 3 per cent, moderate bleeding in 36 per cent, and a very small amount of bleeding was experienced in 61 per cent. The indwelling catheter was removed on the seventh or the eighth day after open prostatectomy and on the fourth or fifth day after a transurethral operation. Postoperative urinary incontinence occurred in 8 per cent. Eight per cent of the patients who had transurethral resection of the prostate had to undergo a second operation. Postoperative epididymitis occurred in 7 per cent of the patients.

The main causes of death were thrombosis and embolism. To prevent these serious complications, early ambulation and elastic stockings were utilized.

The suprapubic transvesical prostatectomy is, in the opinion of the authors, a sensible operation which as far as mortality, morbidity, and functional results

are concerned compares very favorably with any other method of prostatic surgery.

—*S. Richard Muellner, M.D.*

PENIS

Roentgenograms of the Corpora Cavernosa (Kavernosogramme). J. Molnár and E. Hajós. *Zschr. Urol.*, 1960, 53: 441.

Roentgenography of the corpora cavernosa is believed to be of value in certain diseases. The technique utilized was found to be essentially harmless and was performed as follows:

After disinfection of the sulcus of the corona glandis novocaine is injected into the skin by means of a fine needle. Through this injected area a larger needle is inserted, first into one and then into the other corpus cavernosum, and a contrast medium, such as that used for intravenous pyelography, is injected somewhat rapidly. Roentgenograms of the injected phallus are then taken.

Injuries or diseases affecting the corpora cavernosa can be demonstrated by roentgenography without any danger to the patient.

A few clinical examples demonstrating the usefulness of this procedure are cited.

—*S. Richard Muellner, M.D.*

Sexual Impotence as a Symptom of Arterial Block of the Vessels in the Pelvis (Die Impotenz als Sumptom der arteriellen Durchblutungsstoerungen im Beckenbereich). Rudi Scheer. *Münch. med. Wschr.*, 1960, 102: 1713.

There is considerable comment in the literature on the effect of sympathectomy on sexual potency, but there are very few reports dealing with impotence as a symptom of blockage of the large arteries going into the pelvis, namely, the lower end of the aorta, the bifurcation of the aorta, the common iliac arteries, and the external and internal iliac arteries.

The effect of sympathectomy on sexual potency cannot be unequivocally stated. Some investigators believe that sympathectomy has no effect on sexual potency at all, others ascribe various degrees of impotence to it.

A small series of patients has been reviewed from the point of sexual impotency as a potentially early symptom of arterial block. The patients were divided into three groups: those in whom the lower aorta or the bifurcation of the aorta was blocked, group 1; those in whom the common iliacs were blocked, group 2; and those in whom the external or internal iliac artery was blocked on one or both sides, group 3.

The incidence of sexual impotency was highest in group 1 and manifested itself as an early symptom which was not influenced by therapy. The patients in group 2, especially if the block was bilateral, almost always lost their sexual potency. Those in whom the arterial block occurred lower and deeper in the pelvis, especially if it were on one side, also experienced sexual impotence which might eventually improve in some patients.

—*S. Richard Muellner, M.D.*

Gangrene of the Genitalia as Seen in Advanced Periurethral Extravasation with Phlegmon. J. A. Gray. *J. Urol.*, Balt., 1960, 84: 740.

At present, many of the younger generation of general practitioners as well as urologists have not seen enough cases of patients with this entity to be acquainted with their therapy.

Extravasation at any place in the genitourinary tract is of serious importance and requires complete knowledge of the anatomy involved as well as the principles of surgical drainage and those of reestablishment of the continuity of the urinary tract. The author reviews the anatomy of Colles' and Buck's fascia.

The cause of the extravasations from the urethra is discussed under three headings: (1) mechanical—weakness proximal to a urethral stricture; (2) traumatic—such as injuries, perineal surgery, or instrumentation; and (3) infection. Infection, of course, is the source of the major danger in extravasations. Periurethral phlegmon and gangrene are direct results and if uncontrolled may end in death.

The author discusses the clinical picture and the suggested therapy and includes illustrations. This article is an excellent review of a topic which should be a familiar one, but is not.

—*John R. Herman, M.D.*

SURGERY OF THE GENITOURINARY TRACT

KIDNEYS AND URETERS

Modification of the "Howard Test" for the Detection of Renal-Artery Obstruction. A. RAPOPORT. *N. England J. M.*, 1960, 263: 1159.

THE AUTHOR REPORTS a modification of the Howard test for the detection of renal artery obstruction. Among the reasons given for discarding test results was that 15 to 20 per cent of the catheterization studies were considered noninterpretable because of technical difficulties, namely, cessation of urine flow during a collection period; excessive leakage of urine around the ureteral catheters; inadequate urine volume; and inconsistent results over several collection periods.

The author, therefore, proposes a simple index, the tubular-rejection-fraction ratio (TRFR) for the detection of renal artery obstruction in patients with hypertension, stating that the most important advantage of the TRFR is that it is independent of urine volume measurement and is therefore not affected by leakage around the ureteral catheters during the performance of the Howard test. In addition, it requires only two simple chemical estimations performed on samples of urine. Since creatinine is a natural constituent of body fluids, its measurement obviates the intravenous infusions of inulin and blood sampling required in the determination of either inulin clearance or urine-to-plasma ratio of inulin and, finally, TRFR permits a comparison of results in different patients as well as those of repeated tests in the same patient. —*Paul R. Leberman, M.D.*

The Radiorenogram, with Radiorenografin-I^{131}, as a Diagnostic Aid in Urologic Problems. ARTHUR F. ABT and VINCENT A. BALKUS. *J. Urol.*, Balt., 1961, 85: 95.

BECAUSE of its reduced toxicity and its failure to concentrate in the liver as well as the ability to test without a priming dose, radiorenografin-I^{131} was the diagnostic material of choice in the performance of a series of radiorenograms by the authors. They performed the test with the patient in the prone position, prepared the skin areas over both kidneys by outline with the aid of a roentgenogram, and placed the scintillation probes over the kidney areas. The dye was injected intravenously after which 30 minute tracings were simultaneously recorded for both kidneys by two rectilinear recorders. On the curves obtained, the vascular segment caused by kidney radioactivity is represented by the initial rapid rise of the curve shortly after injection of the dye and the excretory segment by the gradual slope of the curve over the 30 minute period.

In the series of patients presented were included bilaterally normally functioning kidneys in which the initial vascular phases were of equal height and the excretory phase revealed an equal steady gradual decline in the curves of both kidneys.

The various examples of application of the radiorenogram would suggest that potentially its greatest use might well be in the survey of renal function and that it may replace the intravenous urogram.

—*Peter L. Scardino, M.D.*

Clinical Experience with a New Test Agent for the Radioisotope Renogram: Sodium Orthoiodohippurate-I^{131}, Hippuran-I^{131}. CHESTER C. WINTER, ROBERT A. NORDYKE, and MANUEL TUBIS. *J. Urol.*, Balt., 1961, 85: 92.

HIPPURAN-I^{131} has been found to be a nearly ideal test agent for use with the radioisotope renogram. Hippuran is a heat resistant, stable, easily prepared, inexpensive, nontoxic agent that is rapidly cleared from the blood of the kidneys and does not affect the liver as does diodrast-I^{131}. Its biologic half life is 20 minutes and it therefore does not offer a radiation hazard. Recovery from the urine as high as 75 per cent in 30 minutes has been demonstrated, and the renograms clearly show an advantage over those obtained with the use of diodrast, hypaque, and other agents tested.

Characteristic renograms with hippuran-I^{131} reveal a higher secondary rise than those with diodrast in the representation of tubular function as well as a more rapid ascent of the secondary rise and a more rapid ascent than with hypaque. There is likewise a faster and greater terminal descent of the tracing than that given by hypaque, demonstrating a faster blood clearance. This test actually is completed in two-thirds the time required for a test with hypaque as shown by one of the tracings. The usefulness of the radioisotope renogram is enhanced by the use of this new test agent, hippuran-I^{131}.

—*Peter L. Scardino, M.D.*

Nephrocalcinosis. L. N. PYRAH and A. HODGKINSON. *Brit. J. Urol.*, 1960, 32: 361.

SEVENTY-SIX CASES of nephrocalcinosis are reported, 24 of which were observed by the authors at the General Infirmary, Leeds, England. This diagnosis was reserved for those patients having renal parenchymal calcifications which could be demonstrated roentgenologically. This condition is to be differentiated from microscopic renal calcification, the diffuse calculosis seen with pyonephrosis, and the dystrophic calcification of renal tuberculosis. In this series, the disease was bilateral in 67 patients and unilateral in only 9. The majority of patients had urologic symptoms, such as renal colic, backache, hematuria, and the passage of small calculi. The roentgenograms varied, the most common type showing spotty calcification in the area of the renal pyramids.

The underlying cause of the disease was not determined in 23 of the 76 cases. The known causes, in order of frequency, were: renal tubular acidosis, hyperparathyroidism, pyelonephritis, milk alkali syndrome, hyperoxaluria, and medullary sponge kidney. Representative roentgenograms are presented and the need for further research on this disease is emphasized. —*Vincent J. O'Conor, Jr., M.D.*

The Surgery of the Kidney in the Treatment of Renal Stone. H. HAMILTON STEWART. *Brit. J. Urol.*, 1960, 32: 392.

THE AUTHOR DESCRIBES his basic rules and techniques in operating on patients with renal stones and adds a method of treatment of secondary stones in horseshoe kidney.

The type of stone, primary and caused by Randall's plaques and in the parenchyma or secondary, situated in the pelvicalyceal system, and caused by stasis, may be a determining factor in the nature of the operation. The presence of a primary stone requires a partial nephrectomy procedure to free functioning renal tissue from calcific bodies.

An assessment of the case is made only after studies of high quality roentgenograms of the exposed kidney. The author describes the kidney exposure, dye injection for delineation of the collecting system, and roentgenographic techniques to accurately locate calcific material in the pelvicalyceal system and renal tissue.

Control of hemorrhage for more intricate operations is necessary and an inflatable pedicle clamp for this purpose is described and illustrated. Before release of the clamp all blood clots must be removed, calyceal openings accurately closed, calyceal segments without drainage channels must be excised, and main arteries clamped.

For partial nephrectomy the author prefers a wide angled wedge section. In primary stones segmental resection and not calycectomy is necessary to avoid recurrence. In closing the wound after suturing of the major calyx and control of vessels, a continuous stitch is taken superficially through the deep edges of the wound and loosely placed. Under this layer, passing at right angles to the long axis, several interrupted parenchymal sutures are tied. The ends of the continuous suture are tied to the interrupted stitches at the top and bottom of the renal wound.

Problems pertinent to resections of the lower and upper poles are discussed. Resection of the upper pole is fraught with more danger because of vascular anatomic problems. Resection of the middle portion of a kidney for stone usually involves removal of the upper or lower pole also and is rarely performed.

As an additional useful aid in longer operations, the technique of hypothermia has been used in 41 operations. The lowest temperature on the outside of the kidney has been 70 degrees F., obtained in 10 minutes. The preferred cooling method is the use of isotonic saline in closed polyethylene bags, with one bag on each side of the pedicle and others around it.

A new method of treatment of secondary stones in horseshoe kidney is discussed. The basic principle involves use of nephroplasty, a nephroplication operation. After the stones have been removed and the bridge divided, the decapsulated poles of the kidney are brought together posteriorly and held in this position by chromicized catgut tape 5/8 inch wide. The isthmus and the lower pole now occupy a posterior position, the pelvis is located at the bottom of the renal mass, and normal relationships of calyces, pelvis, and ureter are established. This procedure is clarified by diagrammatic and roentgenographic illustrations. —*Allan K. Swersie, M.D.*

Effectiveness of Anabolic Agents Nilevar and Colchicine in the Therapy of Patients Who Form Uric Acid Stones. FRANK W. LONGO and H. H. ZINSSER. *J. Urol.*, Balt., 1960, 84: 766.

TESTING THE HYPOTHESIS that about 40 per cent of the uric acid in the male is derived from the testes and certain drugs which produce a drop in fertility also reduce uric acid turnover, the authors administered two of these compounds—nilevar and colchicine—to 19 patients with recurrent uric acid calculi. After the patients were started on a low-purine diet (120 mgm. per day) and daily sodium bicarbonate (1.2 gm. 4 times daily), these compounds were administered and both serum and urine levels of uric acid measured. Nilevar was given in doses of 10 mgm. 3 to 5 times daily. Colchicine was given in doses of 0.1 mgm. twice daily. In all but 1 patient, a definite further decrease in uric acid excretion was noted with both compounds. Similarly, all but one showed a decrease in serum uric acid after receiving these drugs. Side effects were minimal and the depression in spermatogenesis was apparently reversible. The authors suggest that further studies of these compounds be carried out in patients with recurrent uric acid calculi. —*Vincent J. O'Conor, Jr., M.D.*

The Diagnosis of Primary Hyperparathyroidism in Cases of Renal Lithiasis. A. R. HARRISON. *Brit. J. Urol.*, 1960, 32: 383.

THE DIFFICULTIES in the diagnosis of primary hyperparathyroidism in patients with urinary calculi are emphasized. In a series of 292 patients with calcium-containing urinary stones, 22 patients with hyperparathyroidism were found. None of these patients had evidence of bone disease, many had extensive renal involvement, and the average duration of symptoms was 7 years. The occasionally short history of calculous disease suggests that all patients with calcium stones should undergo evaluation for possible parathyroid dysfunction. The author places great reliance upon the elevation of serum calcium and, although significant fluctuations do occur, elevation was demonstrated in all patients in this series on at least one determination. The plasma phosphorus levels were much less significant in this group of patients. Studies of phosphate reabsorption have been helpful, although the author's experience with these is limited. A useful test for distinguishing patients with idiopathic hypercalciuria is the direct measurement of ionized calcium. The calcium level is elevated in hyperparathyroidism and may be diagnostic when it is normal. Two patients were observed who had spontaneous regression of this disease. One of these was found to have areas of degeneration in the adenoma, suggesting the reason for this remission. —*Vincent J. O'Conor, Jr., M.D.*

Prophylactic Hemodialysis in the Treatment of Acute Renal Failure. PAUL E. TESCHAN, CHARLES R. BAXTER, THOMAS F. O'BRIEN, JACK N. FREYHOF, and WILLIAM H. HALL. *Ann. Int. M.*, 1960, 53: 992.

THE PROPHYLACTIC APPLICATION of hemodialysis is employed by the authors in the treatment of acute renal failure and the authors suggest its use whenever possible. They postulate the following as a basis for their investigation.

1. The uremic syndrome is often largely reversible by the dialysis procedure.

2. Sepsis and other complications which are not reversible by dialysis frequently develop in uremic patients and commonly cause death.

3. The complications may reflect a cumulative injury of many tissues by the same toxic, dialyzable substance that presumably produced the uremic syndrome.

4. Therefore, prophylactic dialysis applied before uremic symptoms appear should prevent both the uremic syndrome and many of its commonly lethal sequelae.

This report deals with 15 patients referred to the Renal Center, U. S. Army, Surgical Research Unit for treatment of oliguric acute renal failure and who would be treated with a series of prophylactic hemodialysis before the nonprotein nitrogen reached 200 mgm. per cent and obvious symptoms of uremia appeared. —*Paul R. Leberman, M.D.*

Routine Urine Cultures in Private Practice. ROBERT E. WINDOM, ROBERT K. BASS, ROBERT B. MCBRIDE, and JAY P. SANFORD. *Am. J. M. Sc.*, 1961, 241: 14.

"STERILE-VOIDED" midstream urine specimens were collected from 100 unselected female patients seen in the practice of internal medicine. A significant bacteriuria of over 50,000 bacteria per ml. was found in only 1 patient. She was nulliparous and had never been catheterized. Twelve others in the series had had previous renal disease, including 2 with chronic pyelonephritis and 1 with a right renal stone, and none of these had bacteriuria.

This low incidence of significant positive cultures indicates the suitability of "sterile-voided" specimens in procuring urine cultures, particularly in screening large groups, since catheterization produces infection in 2 to 3 per cent of cases. The value of detecting this small per cent of asymptomatic bacteriuria is open to question. —*Stanley W. Tuell, M.D.*

Another Hopeful Look at Ureterosigmoid Anastomosis. REED M. NESBIT. *J. Urol.*, Balt. 1960, 84: 691.

"WHEN SUPRAVESICAL urinary diversion becomes necessary in any patient, the problem that confronts the surgeon is a most serious one. Any operation that he performs creates an arrangement that at best is a poor substitute for the human functioning bladder. Many patients can accommodate themselves satisfactorily to cutaneous urinary drainage if survival depends upon this arrangement, but other people will find the cloacal status to be a much more acceptable compromise for reasons of aesthetic or social well-being, even at the expense of an increased risk of morbidity." With these words, the author points up the necessity for continued study and use of ureterosigmoid anastomosis. This operation, which has been largely replaced by diversion of the ureters to isolated ileal segments, still has a place in the urologic armamentarium.

This treatise, based upon the Ramon Guiteras' Memorial Lecture, sketches the developmental history of ureterocolic anastomosis and discusses in detail the many theories regarding inherent complications, such as hyperchloremic acidosis and hypokalemia. Several newer methods for performing this operation, combining the submucosal tunnel and intraluminal nipple procedures, are described in detail.

Case histories of patients operated upon 20 to 30 years ago are presented, demonstrating excellent long-term results with ureterosigmoidostomy, an operation which, in the author's opinion, continues to have a definite place in urinary diversion.

—*Vincent J. O'Conor, Jr., M.D.*

BLADDER AND URETHRA

Pathogenesis and Treatment of Interstitial Cystitis (Etiopathogénie et traitement de la cystite interstitielle). JOSÉ MA. GIL-VERNET, V. GONZÁLEZ, and E. FERNÁNDEZ. *Acta urol. belg.*, 1960, 28: 425.

THE TRUE nature of interstitial cystitis and its tendency to resist all forms of therapy have led to a multiplicity of etiopathologic concepts of this disease as well as to a multitude of therapeutic attempts to cure it. The authors have reviewed this subject and have re-emphasized the usual etiologic concepts.

A general review of the therapy is included in the article, but when all other measures have failed and the only recourse is to divert the urinary stream to either skin or the bowel the authors suggest the colocystoplasty. This operation has been performed in 33 patients without a death. Two principles are followed: (1) The removal of the entire portion of the bladder that would be capable of reproducing the lesion, that is, the free portion of the bladder by ample subtotal cystectomy, preserving the trigonal area, and leaving only sufficient tissue about the trigone for the anastomosis of the sigmoid; and (2) restoration of the anatomic and functional bladder capacity with a segment of sigmoid colon 25 cm. in length to act as the detrusor.

In 1 of the patients who had a subtotal cystectomy and a colocystoplasty, painless hematuria developed 6 months after the operation. A well tolerated cystoscopy showed the hemorrhage to be coming from an ulcer area near the vesical neck along the vesicoenteroanastomotic line. This ulcer was easily fulgurated, and after this procedure the patient 2.5 years later had had no recurrence of symptoms, voiding every 3.5 hours during the day and 2 or 3 times during the night.

The excretory urograms and cystograms of 2 patients included in the article show an excellent result from this operation.

The pathogenesis of interstitial cystitis suggests a psychosomatic cause. Although the treatment proposed, removal of the detrusor by extensive partial cystectomy and replacing it by a segment of sigmoid colon, does not remove the initial cause of the disease, it certainly provides relief from symptoms for the patient and, as the included roentgenographic studies of 2 patients would indicate, a relief from gradual destruction to the upper urinary tract.

—*Conrad A. Kuehn, M.D.*

Endoscopic Therapy of Vesical Papillomas (La terapia endoscopica dei papillomi vescicali). O. SALATI and S. POLLASTRI. *Urologia*, Treviso, 1960, 27: 526.

THE MATERIAL for this study consisted of 103 cases of vesical papilloma observed by the authors and of a

review of the medical literature on the subject. Of the 103 patients, 56 had solitary papilloma, 18 had multiple papillomas, and 29 had diffuse papillomatosis.

Of the 47 patients treated endoscopically by diathermocoagulation or by fulguration, recurrences developed within 2 years in 25 per cent of the group with solitary lesions, 78 per cent of the group with multiple lesions, and in 100 per cent of the group with diffuse papillomatosis. Of the 52 patients treated surgically, recurrences developed within 2 years in 36 per cent of those with solitary lesions, in 62 per cent of those with multiple lesions, and in 74 per cent of those with diffuse papillomatosis. These figures suggest that the best results from treatment may be expected in those patients who are susceptible of being treated endoscopically, and that the results are better with each decrease in the original number of lesions for each individual case.

The authors did not note any beneficial effects from either the treatment with podophyllin or from cobalt therapy. The authors are aware that many urologic surgeons favor total cystectomy as the therapy of choice for diffuse papillomatosis; however, they believe that this operation should be reserved exclusively for those lesions in which malignant degeneration is suspected or when the development of the papillomatous condition is of such a nature as to present a serious obstacle to the expulsion of urine through the ureters. —*John W. Brennan, M.D.*

ADRENAL GLANDS

Neural Control of the Hormonal Function in the Adrenal Cortex (La regolazione neuro-ormonale nel cortico-surrene). G. MARCHIORI and G. FORIN. *Chir. pat. sper.*, 1960, 8: 553.

THE AUTHORS, in undertaking their research, intended to study the histologic changes, if any, occurring in the cortex of the suprarenal glands after sympathectomy.

The study was made in dogs divided into 3 groups. In the first group, the splanchnic nerves were sectioned; in the second group, the celiac ganglion and the upper three lumbar ganglia were ablated in addition to sectioning of the splanchnic nerves. The animals of the third group were controls sham-operated on by oblique left lumbar incision parallel to the twelfth rib. At 8, 15, 30, or 60 days after the operations, the animals were sacrificed and the suprarenal glands were removed. The microscopic structural and cytologic appearances of the glands were studied by the following methods: hematoxylin and eosin stain, sudan III for total lipids, Gomori-Danieli method for alkaline phosphatase, and the Seligman-Ashbel stain for demonstration of corticosteroids.

Changes were found to occur in the fasciculated and glomerular zones and consisted of diminished thickness with hypertrophy of the enveloping fibrous capsule and of its intraparenchymal trabecular prolongations. The cells of the secreting tissue appeared to be smaller and showed uniform cytoplasmic eosinophilia. These hypotrophic and hypoplastic changes became evident 30 to 60 days after sympathectomy and were more pronounced when ablation of the lumbar sympathetic ganglia and of the celiac ganglion was associated with resection of the splanchnic nerves. Histochemically, a diminution of lipid and steroid content and a decreased phosphatase activity could be demonstrated. The zona reticularis did not appear altered.

The authors interpret their findings as indicative of the existence of a direct control exercised by the sympathetic nervous system upon the function of the adrenal cortex. This control may be subordinate to and less important than the hypophysial hormonal mechanism of regulation but it should not be disregarded as insignificant.

—*Eckhard Fischer, M.D.*

Tests of Pituitary-Adrenal Suppressibility in the Diagnosis of Cushing's Syndrome. GRANT W. LIDDLE. *J. Clin. Endocr.*, 1960, 20: 1539.

ATTEMPTS to differentiate the causes of hyperadrenocorticism by pituitary suppression with exogenous corticosteroids have not been uniformly successful using the standard steroid compounds. The author describes the results obtained with a standard ACTH suppression test using two of the more potent corticosteroids, delta-1-9-alpha-fluorocortisol and dexamethasone, and presents results which appear to be reproducible and diagnostically significant.

In 54 normal patients these agents, given in a dosage of 0.5 mgm. every 6 hours for 8 doses, induced almost complete supression of 17-hydroxycorticoid excretion. In contrast, all 35 patients with Cushing's syndrome maintained relatively high 17-hydroxycorticoid excretion during such treatment. Therefore, in low doses these agents were useful in separating normal patients from those with Cushing's syndrome.

A larger dose of 2.0 mgm. every 6 hours for 8 doses was used to differentiate those patients with bilateral adrenocortical hyperplasia from those with adrenocortical tumors. All of the patients with adrenocortical hyperplasia showed a definite decrease in 17-hydroxycorticoid excretion with this larger dose, whereas those patients with autonomously-functioning tumors did not. This latter test, therefore, provides valuable information in the preoperative evaluation of such patients.

An interesting byproduct of this study was the lack of significant effect on this test by unilateral, or subtotal, adrenalectomy. This finding substantiates the prevalent surgical opinion that total adrenalectomy is probably the procedure of choice when surgical intervention is contemplated for Cushing's syndrome due to adrenocortical hyperplasia.

—*Vincent J. O'Conor, Jr., M.D.*

SURGERY OF THE MUSCULOSKELETAL SYSTEM

BONES AND JOINTS

Anatomopathologic and Diagnostic Considerations of Eosinophilic Granuloma of the Bone (Il granuloma eosinofilo delle ossa; considerazioni anatomo-patologiche e diagnostiche). A. SALVINI. *Arch. ital. chir.*, 1960, 86: 329.

THE AUTHOR DESCRIBES 3 personal observations of eosinophilic granuloma of the skull, 2 located in the parietotemporal bones and 1 in the frontal bone. In all cases local symptoms only were present. In 2 of the patients these were represented by localized pain, sharp in character, which had been present for 2 months. In the third patient, a 12 year old boy, there was a history of a slight trauma to the right frontal region which occurred 15 days prior to the appearance of diffuse edema in the same area. This was the only complaint that brought the patient to seek medical advice 1.5 months after the onset of the edema. On roentgenographic examination the granulomas appeared as well circumscribed lesions. In all cases the removal of the new growth resulted in a cure. Histologic diagnosis of eosinophilic granuloma was made.

The author discusses the histologic picture of this granuloma in relation to Gaucher's disease, Hand-Schüller-Christian disease, and Abt-Letterer-Siwe disease as well as to the microscopic appearance of the eosinophilic granuloma in parts of the body outside the skeleton.

The author concludes that eosinophilic granuloma of the bone should be considered as a histologic syndrome of the bone marrow.

—Riccardo Benvenuto, M.D.

Malignant Synovioma. RONALD G. VINCENT. *Ann. Surg.*, 1960, 152: 777.

THE TERM "synovioma" was first introduced by Lawrence W. Smith in 1927. He believed that this tumor might best be identified, classified, and indexed according to its site of origin rather than its histiogenic characteristics. Since the term connotes a benign neoplasm, a prefix of "malignant" is appropriate; thus, "malignant synovioma" better describes this neoplasm.

The author reports 12 cases and summarizes the previous literature to give a total of 176 cases for consideration in his report. In 52.8 per cent of these 176 cases the ages of the patients were between 20 and 40 years, the youngest being 2 weeks and the oldest 82 years old. The average age was 36.6 years. One hundred patients were males and 76 were females. In 71.6 per cent of the total the malignant synovioma occurred in the lower extremities, with 37.5 per cent being about the knee. Only 8 per cent occurred in the hand.

Eight of the author's 12 patients reported pain, tenderness, and an associated mass as their presenting symptoms. Other authors have reported pain in 50 per cent and tumor and dysfunction in 62 per cent, with swelling of the part involved in only 12 per cent. The author notes with regret that the symptoms of this disease are not more definite, for, as has been pointed out, the interval between onset of symptoms and specific therapy averages 36 months.

As to diagnosis, the author comments that all laboratory aids and roentgenographic examination may be of value but that the only certain diagnosis must be made by surgical biopsy. The primary route of metastasis of these synoviomas is by the blood stream, but the author believes that there is sufficient evidence to indicate that the lymphatic system is definitely a secondary route. In various series, 65 to 90 per cent of the metastatic lesions are pulmonary. The general progress of the disease appears to be fairly slow, with metastasis occurring late.

The treatment of malignant synovioma has been unsuccessful. Very few 5 year survivors had been reported before Pack's large series. The author observed a recurrence rate of 66 per cent when treatment consisted of simple local resection, and suggests use of wide local excision followed shortly by irradiation. He emphasizes that this local excision must be radical.

—Einer W. Johnson, Jr., M.D.

Surgical Fixation of Small Important Bone Fragments with Hookplate. WILHELM A. ZUELZER. *J. Am. M. Ass.*, 1960, 174: 2055.

THIS REPORT summarizes the author's experience with the hookplate in treating fractures of joints and is based on a series of more than 450 cases. The hookplate was first used in 1948 and reported on in 1949 and 1951. It consists of a curving plate that is split at one end for about a third of its length, the ends of the split portion being angled 90 degrees and sharpened so that they may be buried in the bone fragment. One or two screw holes are available in the solid end of the plate so that it may be fixed adequately by screw.

The author believes that this method of fixation, particularly for fractures about the ankle joint and of the olecranon, is of especial value since it allows fixation of a fracture at an angle of 90 degrees with the distracting force.

The author states that absolute indications for use of the hookplate are comminuted fracture of the medial malleolus, comminuted fracture of the olecranon, and any fracture with osteoporotic fragments. Relative indications for use of the hookplate are fracture of the medial malleolus, pseudarthrosis of the medial malleolus, fracture of the ankle with widening of the mortise, fracture of the lateral malleolus, and simple fracture of the olecranon.

—Einer W. Johnson, Jr., M.D.

Congenital Absence of Functioning Thumb. DAVID MATTHEWS. *Plast. & Reconstr. Surg.*, 1960, 26: 487.

ONE OF THE MOST disabling of the frequently occurring congenital abnormalities of the hand is the absence of a functioning thumb. The child then has to try to grasp objects between adjacent digits or between the

digits and the palm. If the condition is bilateral the handicap to social development, education, and the ability to earn a living is very considerable, despite the marvelous adaptability of children. The thumb may be either totally absent or present but rudimentary. In either case the trapezium is always absent and the scaphoid often malformed. The trapezoid is normal and is normally articulated with the metacarpal of the index finger. The thenar musculature is usually absent, but occasionally there is a small, ill-defined muscle mass on the radial side of the metacarpal of the index. This is of no functional value but is cosmetically useful.

Rudimentary thumbs are always small and are attached far forward on the radial side of the index, close to the metacarpal head. The pedicle of attachment is very thin and contains no bone, a single large blood vessel, and one, or sometimes two, small digital nerves. It is therefore completely flaccid, having no bony continuity with the carpus or the metacarpal, and no tendons. The mobility of such a digit occasionally leads to gangrene from occlusion of the vessel in the pedicle, but more often the digit survives and has to be strapped to the index to keep it out of the child's way.

The thumb may be amputated, but this is not often desirable, particularly if it is large. If the thumb is large enough, it may be moved back with its neurovascular bundle, reattaching it to the base of the second metacarpal by a "match stick" bone graft from the ileum. It is immobilized in plaster for 6 weeks. It will require protection usually with a polythene pull-on splint until it can be fused at about the age of 16. Inasmuch as the digit always remains small, it is often best to perform a simple amputation and to pollicize the index finger by the Littler technique. The author operates when the child is at least 3 years of age. He has discussed a problem replete with difficulties and shown his results with excellent photography. —*Preston J. Burnham, M.D.*

Adduction or Apposition? A New Movement of the Thumb. K. B. Bhargava. *J. Postgrad. M.*, Bombay, 1960, 6: 160.

The carpometacarpal joint of the thumb is the most evolved joint in the anthropoid body, lending to the human hand its unsurpassable utility and versatility. The author discusses the controversy which exists over the movements of flexion, extension, adduction, and abduction. The relationship of movements to the anatomic position of the thumb, as well as to the axis of the carpometacarpal joint, is illustrated. Relative to the action of the adductor pollicis, the author accepts a new movement for the thumb, i.e., apposition, and concludes that the thumb has not seven, but eight movements, including flexion, extension, adduction, abduction, rotation, circumduction, opposition, and apposition.

—*C. Fred Goeringer, M.D.*

Narrowing of the Intervertebral Disc Space in Children. James R. Doyle. *J. Bone Surg.*, 1960, 42-A: 1191.

The case reports of 16 children with destructive lesions of the spine and involvement of the intervertebral disc are presented. The typical history is that of pain in the back, stiffness, fever, night crying, and refusal to walk for a week or 10 days prior to admission to the hospital. Characteristically, the child is irritable and has severe spasm of the muscles of the low part of the back with accentuation of the lumbar lordosis. The temperature is elevated and the leukocyte count and the sedimentation rate are also slightly elevated. The temperature usually returns to normal within 1 or 2 weeks. The symptoms persist for 3 or 4 weeks. Initially, roentgenograms of the spine are normal, but 1 to 2 weeks later a narrowing of intervertebral space may be observed. During the next 2 to 8 months there is a gradual widening of the intervertebral space, and in very young children, the involved interspace may be restored virtually to normal within a year.

The literature is reviewed. The clinical and roentgenographic findings in these patients are not typical of the usual form of vertebral osteomyelitis. Vertebral involvement was minimal and was noted in only 3 patients. It is the author's opinion that the lesion represents an infectious process completely or almost completely limited to the intervertebral disc. Thirteen of the patients in this group were 5 years of age or less. This is significant in view of the greater blood supply to the intervertebral disc in early life.

All patients were treated by bed rest during the acute phase of their illness. After the acute symptoms had subsided, usually requiring about a month, most of the patients were placed in a plaster body jacket or a brace. Eleven of the patients received antibiotics.

—*Sanford Larson, M.D.*

The Frontal Cleft of the Vertebral Body (Ein Beitrag zur frontalen Wirbelkoerperspalte). W. Blauth and A. Hopf. *Zschr. Orthop.*, 1960, 93: 494.

Clefts of the vertebral bodies were found to run in either the sagittal or frontal plane, the sagittal cleft being much more frequently observed than the frontal. Frontal clefts in the bodies were observed in the fetus and in children in the first year. Only a few were observed in later years.

The authors report that in a 19 year old man a nearly total frontal separation of the fifth lumbar vertebra, which was clearly demonstrated by planigraphic roentgenograms, extended nearly through the entire body of the fourth and fifth lumbar vertebrae. Schmorl's nodes were observed in the upper lumbar vertebral bodies and in some of the thoracic vertebrae. This deformity is caused by the lack of fusion of the two ossification centers which form each vertebra. Occasionally these conditions make a differential diagnosis of traumatic lesions difficult.

—*George I. Reiss, M.D.*

Importance of the Direct Approach to the Vertebral Bodies in the Treatment of Tuberculosis of the Spine (Die Bedeutung der Vertebrotomie bei der Behandlung der Spondylitis). W. Reinhard. *Zschr. Orthop.*, 1960, 93: 364.

The author reports his experiences in 250 cases in which direct approach to the vertebral bodies was used. The development of new chemotherapeutic antibiotic drugs has not only enlarged the operative possibilities in the treatment of extrapulmonary

tuberculosis but also has directed this treatment in a new surgical era. The results with the new drugs were often unsatisfactory, because of the insufficient concentration of the drugs in the tuberculous focus as a result of its walling off from blood vessels, and this seems especially true for tuberculosis of the spine.

Generally a posterior approach is used and, although there may be great difficulties, it is possible to reach most lumbar and dorsal foci by this route. In the cervical region an anterior approach is used in front of or behind the sternocleidemastoid; better healing and less frequent occurrence of cervical foci cause this approach to be used only rarely. In the dorsal region great abscesses are formed; they are easily visualized on roentgenograms. Neurologic complications occur often. In the dorsal spine a costotransversectomy is carried out. In some cases resection of one or two roots may be necessary and will not cause important neurologic complications. Opening of the pleural cavity can not always be avoided. In the lumbar region a lumbotransversectomy is recommended for lesions down to the lumbosacral level. In some cases an anterior peritoneal approach is used. Large abscesses must be opened through an extraperitoneal route by means of a long pararectal incision. Great care must be used not to damage the important lumbar roots.

The author uses two drains for a period of 4 to 6 weeks to introduce tuberculostatic drugs into the focus. He believes that the objections to this drainage are groundless. All remaining sinuses close in a relatively short period.

An important advance in the diagnosis of Pott's disease is the use of laminagraphy. Laminagraphy in the anteroposterior and lateral planes is indispensable for determining whether or not operation is necessary. When sinuses are present, a radiopaque substance should be injected by means of a very thin catheter.

Another advantage is the use of endotracheal anesthesia, especially since many of these patients have been bedridden for a long period and are very susceptible to shock and changes of blood pressure. The administration of whole blood is necessary.

In 60 per cent of the cases the histologic material is negative for tuberculosis. A negative result is especially likely if the patient has been treated for a long time with antituberculotic drugs.

A point of discussion is the surgical treatment in what are believed to be early cases. The author believes that even in these cases the disease itself is already of long standing and an operation is advisable if there are no special contraindications. Even in cases in which bony bridges are present a more rapid cure may be obtained by opening the tuberculous focus.

In paraplegia surgical intervention is always necessary with the exception of cases of long standing with loss of sphincter control. In children conservative treatment is usually sufficient. The postoperative treatment is very important and 8 to 12 months of complete rest is usually necessary. This is followed by the application of a plaster jacket and later a leather corset is worn up to 2 years after operation. According to some investigators the same period of treatment is required for conservative and for surgical treatment. The author, however, found that an average of 18 months was required for surgical treatment, whereas for conservative treatment this period varied between 3 and 5 years. In the author's cases the mortality rate was 0.8 per cent.

—J. C. Mulier, M.D.

Idiopathic Scoliosis—Endochondral Dysostosis (Idiopathische Skoliosen—enchondrale Dysostosen). H. Mau. *Zschr. Orthop.*, 1960, 93: 317.

The author describes the laws of Hueter-Volkmann and Pauwels with regard to the endochondral growth of normal bones and their relation to the lesions formerly held responsible for idiopathic scoliosis.

Scoliosis is one of the changes observed in dysostosis, primarily in the generalized, epiphysial, endochondral dysostosis especially in patients with spinal or joint dysplasia.

Morphologically this type of scoliosis has no specific characteristics. It manifests itself during the first decade by a short curvature. Often it is clear that the onset of the deformity is in the epiphysial plates and/or the intervertebral discs. Other signs of dysostotic slowing down of the skeletal growth are observed in the wrist and in the apophysis of the iliac crest. In adults it may be difficult to find signs of the dysostotic disease. In these cases there is a tendency to early deforming spondylitis.

The cause of dysostotic scoliosis must be the asymetric growth of the growth plates of the vertebral bodies and the impairment at the intervertebral discs, which results in a slowing down of the growth on one side. This leads us to the question of whether there is in the true idiopathic scoliosis a dysostotic factor, a slight localized dysostosis of the spine. A more or less latent congenital tendency to dysostosis could be present, often characterized by some minimal dysostotic findings. This idea is illustrated by the histories of two families with idiopathic scoliosis and some dysostotic skeletal changes. These patients had short curves, dysplastic hips, and other dysostotic characteristics. The congenital factor in scoliosis is the strongest argument for a dysostotic genesis, at least in the familial cases with short curves. These cases account for at least one-third of the cases of "idiopathic" scoliosis.

This dysostotic factor, however, cannot be the exclusive or general factor. In juvenile kyphoscoliosis there is probably also a dysostotic component. In curable infantile scoliosis there is also a dysostotic factor. Dysostosis causes the prenatal or postnatal wedged vertebrae that are found in the dorsolumbar kyphosis of achondroplasia.

The author distinguishes the following types of scoliosis: congenital, paralytic, and thoracic; scoliosis associated with neurofibromatosis, endochondral dysostosis, arachnodactyly, or osteogenesis imperfecta; and some cases of scoliosis due to rickets or other until now unknown generalized or localized metabolic disturbances. In the group of idiopathic scoliosis one must consider the infantile scoliosis as a separate entity. From the group of dysostotic scoliosis must be separated the scoliosis with only a dysostotic factor and other slight dysostotic characteristics although a sharp

limit cannot be drawn. The cases of juvenile kyphoscoliosis with a dysostotic factor should also be a separate group. —*J. C. Mulier, M.D.*

Further Studies on Experimental Spondylitis and Intercorporeal Fusion of the Spine. C. Roger Sullivan and Frank E. McCaslin, Jr. *J. Bone Surg.*, 1960, 42-A: 1339.

Sound bony ankylosis of the spinal column invariably occurs after pyogenic infection of the intervertebral space. Further research may permit artificial ankylosis of the intervertebral joints by this means, provided that the obvious dangers of introducing a living pathogenic organism can be eliminated.

At the Mayo Clinic a single lumbar interspace in each of 74 mongrel dogs was treated with an irritant such as sodium morrhuate, talc, potassium stearate and oleate, or croton oil, with a proteolytic enzyme such as sterile human gastric juice, clostridial collagenase, or X-108, or with a suspension of bacteria such as killed Staphylococcus aureus, killed Neisseria gonorrhoeae, or living Staph. aureus.

Solid intercorporeal fusion was obtained in all of the 23 animals treated with living Staph. aureus. Only one fusion was obtained in the 51 treated otherwise, and this was thought to be due to contamination at operation.

A single inflammatory stimulus is not enough to induce bony fusion in the dog's spinal column. It appears that a sustained process in which the intervertebral disk and cartilaginous plates are digested by proteolytic enzymes is required to provide the chemical environment in which proliferation of new bone and fusion occur.

Bone Growth After Spine Fusion. J. T. H. Johnson and Wayne O. Southwick. *J. Bone Surg.*, 1960, 42-A: 1396.

The mechanism of longitudinal growth of bone has been a controversial subject in the literature. The majority opinion has been that all growth in length of the diaphyses of bone takes place at the epiphysial cartilages, whereas growth of bone in other dimensions occurs through hyaline cartilage proliferation or through fibrous tissue proliferation. New observations, both clinical and experimental, have been presented which contribute to still existing opinions. These are thoroughly discussed by the authors.

A clinical study of spinal fusion in young children was carried out and the findings were compared with those reported by Hallock, Francis, and Jones. A rigid set of criteria was made to avoid all of the variable factors present.

The first criterion was that a solid fusion plate had to be clearly visible on the roentgenograms. All cases with pseudarthroses in the measured areas were discarded. Secondly, the first measurement should not be made until at least 4 months after operation. The third criterion was that all patients should have had numerous roentgenograms, preferably once a year. Fourth, the fusion area to be measured should include at least a few undamaged vertebral epiphysial plates, all well within the limits of the fusion mass, and that the length of this fused area should be compared with that of an unfused portion of the spine containing an equal number of growth plates. The fused area being measured should not include an end vertebra. Measurements should be made from the midpoints of the top and bottom vertebral bodies. The fifth criterion was that the follow-up period should be long enough to show significant growth in the unfused areas but not too long, because the physique of the child may change radically and cause gross differences in the magnification of the roentgenograms. These criteria were so exacting that it was possible to find only 6 cases which fulfilled them.

Study of these 6 cases revealed little increase in length of the fused area. The small increase shown could be accounted for by magnification and other technical factors. The authors believe that growth of a fused segment of the spine can occur only at the ends of the segment or at the site of gross or microscopic defects in the fusion plate. Pseudarthroses in spine fusions are believed to be frequent in children. They may be microscopically or grossly visible and may occur spontaneously and heal spontaneously. The authors believe, from their investigations, that there is no such thing as interstitial growth of bone.

—*Donald C. Geist, M.D.*

Extracapsular Arthroplasty of the Hip (L'arthroplastie extra-capsulaire de la hanche). Michel Salmon. *Rev. chir. orthop.*, Par., 1960, 46: 1.

The operation at present employed by the author is in essence based on the technical principles enunciated by Colonna, as reported by Lewis and Ghormley (*Proc. Mayo Clin.*, 1954, 29: 605). The gluteal muscles are left attached to the crest of the ilium, a bar of iliac crest containing the attachments being loosened from the ilium and turned down with these muscles. In this manner the external surface of the ilium and the capsule of the hip joint are fully exposed. The reflex tendon, or tendinous lip of the supraciliary ridge of the acetabulum, is dissected free and turned back to help later in fixation of the bone graft. The joint capsule itself is not opened or otherwise disturbed.

A slot, curving above the capsular attachment, is made in the bone of the supraciliary ridge and the bone graft is fitted into this. The bone graft is cut from the external surface of the ilium. Starting from the cut surface remaining after the detachment of the iliac crest containing the attachments of the gluteal muscles, a slender, double-edged chisel is passed down through the cancellous stratum of the bone, detaching a quadrilateral—not quadrangular—plate of the external compacta of the ileum. This forms the bone graft.

The lower, intact edge of this plate is then fitted snugly into the slot in the supraciliary ridge and molded over the head of the femur, covering it on all sides like a hood. In this process the bony layer of the plate is fractured, leaving the periosteum of the plate intact. The resulting gap is filled in with scraps of cancellous bone so as to firmly anchor the bone graft in place.

The gluteal muscles are now brought back up into place together with the attached portion of the iliac crest which is fixed by wiring in its original position. The surgical wound is closed.

In the cases of femoral luxation and particularly in the subluxations, this operation fixes the femoral head in the acetabulum or constructs a new socket for the head which supports it anteriorly, superiorly, and posteriorly and permits easy movement of the femur. In the cases in which the femoral head is absent, the method conserves joint function satisfactorily and avoids the necessity of an arthrodesis.

The extracapsular arthroplasty is not a panacea for all types of hip joint damage. However the author, after 15 years of experience, is able to suggest its application in all cases in which it can be logically applied and seems to promise clinical amelioration and the forestalling of the subsequent development of arthritic changes. For instance, it may not be indicated in posterior luxations in which the patient is already doing sufficiently well without it.

—John W. Brennan, M.D.

Closed Technique for Intramedullary Nailing of Femur with Tubular Nail (Die Technik der geschlossenen Marknagelung des Oberschenkels mit dem Rohrschlitznagel). Kt. Herzog. *Chirurg.*, 1960, 31: 465.

The author has devised a new nail for intramedullary fixation, tubular in shape with slits in the sides. He is able to pass this successfully in a closed manner. The patient is positioned on a table, lying on the uninjured side with sling traction backward through the crural region and distal skeletal traction on the fractured thigh with a Kirschner wire through the condyles. The knee is bent and the leg supported on a frame.

The traction and counter-traction arrangement frequently aligns the fragments well; this is checked by roentgenograms in two views. A stout guide wire is then driven down from above the greater trochanter along the shaft and into the distal fragment, and the slit tubular nail is passed over this.

The author describes the advantages of his nail. Simple transverse fractures can be snugly held by the round tubular nail exactly fitting the marrow cavity, an advantage over the clover-leaf Küntscher nail. Comminuted fractures, unstable because of lack of contact of the main fragments, are nailed and then Kirschner wires are passed percutaneously into the nail slits and into the opposite cortex. Another technique is that of "braiding" the slit tubular nail by passing a wire in and out of the slits along its length prior to insertion. This technique increases stability by increasing the diameter and friction surface of the nail.

The author has another variation for supracondylar fractures, in which the marrow cavity of the distal fragment is broad and fixation is difficult without involving the knee joint. Special strong wires, stiff but curved on the distal end, are passed through the nail and the curved ends are passed out through the slits in the distal nail into the cortex of the distal fragment.

These methods involve good biplane roentgenography and accurate reduction of the fractures. The author describes in detail how he achieves these ends. He has some mechanical devices for difficult reductions, often necessary on older fractures. If he cannot obtain a satisfactory reduction, he decries resorting to an open technique, preferring to apply balanced traction with another attempt at nailing later.

He treats compound fractures either by immediate nailing or by closure of the wound, balanced traction, and intramedullary nailing 10 to 14 days after the soft tissue wound is healed. He warns against using Kirschner-wire skeletal traction through the distal femur for days or weeks and then passing an intramedullary nail; the pin-track infection invariably present will flare up into infection of the whole marrow canal.

The author states that his method is less traumatic to tissue than the open approach and easier to accomplish than the Küntscher closed methods.

—William B. Gallagher, M.D.

Prevention of Complications During and After Nailing of Separations of the Femoral Capital Epiphyses (Komplikationen waehrend und nach der Nagelung der Epiphyseolysis capitis femoris und ihre Verhuetung). H. Breitenfelder. *Zbl. Chir.*, Leipzig, 1960, 85: 2041.

The author used a triflanged nail in the treatment of 69 patients in the course of 13½ years. The most dreaded complication was aseptic necrosis of the femoral head. The prevention of this complication is based on the decision of whether to nail the femoral capital epiphysis in a displaced position or whether to reduce it prior to nailing. Any method that requires forceful reduction of the femoral capital epiphysis should be avoided.

Reduction of the displaced femoral capital epiphysis should be carried out not later than 48 hours after its displacement and should be performed under general anesthesia. Reduction of the chronically displaced femoral capital epiphysis by the open technique should not be performed, as the results are unsatisfactory. In cases in which a considerable displacement of the femoral capital epiphysis has occurred, the Smith-Petersen nail, which is used in most of these cases, should be placed far enough posteriorly to penetrate the greater part of the displaced fragment. It is important to allow the nail to penetrate the cortical bone of the posterior aspect of the femoral neck between the proximal and distal end, thus avoiding the important nutrient vessels in that region. Complications observed in this procedure, caused by nails which were either too short or too long, were also discussed.

—George I. Reiss, M.D.

Growth Following Transepiphysial Bone Grafts. J. T. H. Johnson and Wayne O. Southwick. *J. Bone Surg.*, 1960, 42-A: 1381.

Studies reporting continued growth in length of solidly fused bone have recently appeared in the orthopedic literature. These studies seemed to be inconsistent with the belief that there is no such thing as intrinsic growth or intrinsic bending of fully formed bone. This article is concerned with experimental investigation of this finding.

The experimental method used consisted in the placement of intramedullary bone grafts across the distal femoral epiphyses of young rabbits. Both knee

joints were entered through incisions, and holes, seven sixty-fourths of an inch in diameter, were drilled on both sides from the intercondylar notch through the epiphysis and epiphysial line and on through the metaphysis into the marrow cavity. A three-quarters of an inch long portion of the fibula was removed and fitted into the drill hole until the end was flush with the articular cartilage. The left side served as a control. The animals were sacrificed at varying times, the lengths of the femora measured, and microscopic sections made and examined.

The microscopic findings were grouped into 4 categories: (1) Fusion: a solid bridge of bone joining the metaphysis and epiphysis and suppression of growth of the cartilage at the epiphysial line; (2) equivocal fusion: considerable bone formation with no loss of continuity and moderate suppression of growth of the epiphysial cartilage; (3) equivocal loss of continuity: considerable bone formation but definite evidence of stretch alignment of the trabeculae, a break in continuity of the bone and mild to moderate suppression of growth of the epiphysial cartilage; and (4) loss of bone continuity: a large gap filled with fibrous tissue and no suppression of growth of the epiphysial cartilage.

This histologic material demonstrates the presence of loss of continuity in the bone trabeculae traversing the drill holes across the growing femoral epiphyses of the rabbits. These defects developed gradually and appeared mainly 20 or more days after implantation. Despite the formation of bone, this defect developed and epiphysial growth continued. The exact mechanism of the function of these bone defects is not known. Since the effect of motion was eliminated in the experiments, these findings suggest the reason for continued bone growth in instances of experimental bone fusion. —*Donald C. Geist, M.D.*

Isolated Fracture of the Third Malleolus (La frattura isolata del terzo malleolo). L. Boccanera and A. Salvagni. *Chir. org. movim.*, 1960, 49: 316.

This report concerns 25 cases of patients with posterior marginal fracture of the tibia treated at the Istituto Rizzoli of Bologna, Italy.

After a brief review of the pertinent literature, the authors describe the cause, pathogenesis, clinical picture, and treatment of this type of fracture which is also referred to as fracture of the third malleolus.

Closed treatment was undertaken in all but 3 cases in which marked displacement was present. In these patients the displacement was reduced by direct pressure on the tibia according to Delitala's technique. In all cases excellent results were obtained.

—*Maria Serratto, M.D.*

Fractures of the Articular Surface of the Upper End of the Tibia (Fractures articulaires de l'extrémité supérieure du tibia). J. Duparc and P. Ficat. *Rev. chir. orthop.*, 1960, 46: 399.

The authors treated 204 patients with simple and compound fractures of the articular surface of the upper end of the tibia. Conservative orthopedic methods were used in 73 cases. Open surgical repair was performed on 131 patients, 86 of whom had a recent fracture and 45 an old fracture.

The authors begin their report with the outline of a rather lengthy and complex classification of the fractures of the upper end of the tibia involving the articular surface. The therapeutic approaches and surgical procedures used for the past 20 years are reviewed. They proceed, then, to describe a simplified version of the classification used as guidance in formulating treatment, as follows: (1) Fractures in good alignment and no separation of the fragments; (2) fractures in good alignment with slight separation of the fragments; (3) fractures with compression of the articular surface; and (4) mixed fractures.

Judging by results obtained in 204 cases, the authors believe that the conservative orthopedic approach is indicated in all fractures in good alignment and with no separation or only slight separation of the fragments. In fractures with depression of the articular surface or in mixed fractures, open reduction and immobilization give the best results.

Of 73 patients treated conservatively, 64 were followed up for a maximum of 5 years. Thirty-four recovered completely, 17 had a good anatomic and a fair functional repair, and 13 had to be reoperated on. Failure was attributed to faulty selection of these candidates for conservative treatment.

The authors' method of conservative treatment consisted of complete immobilization of the fractured leg in a plastic case with the knee in varus position and the foot free for 4 weeks, followed by another period of 2 to 4 weeks in the case and with light exercise. After that, a new cast was applied and weight bearing was gradually permitted. Eighty-six patients with recent fracture were treated by operative reduction and, of 80 patients followed-up for a 5 year period, 68 showed excellent anatomic and functional repair, 4 had to be reoperated on, and in 8 the result was considered fair. The 45 patients with old fractures were also treated surgically, but no detailed report is given. The authors refer to articles published previously. Complications after surgical intervention consisted of osteoarthritis in 2 cases and phlebitis in 2 cases.

The authors recommend general or spinal anesthesia as superior to local anesthesia. Adequate exposure of the knee joint was obtained through a wide horizontal incision. Reduction was maintained by nails, screws, plates, or bone grafts. Excision of the meniscus was performed every time its presence constituted an obstacle to the treatment.

—*Olga Haring, M.D.*

Transmetatarsal Amputation. Gilbert B. Bradham, William H. Lee, and J. Manly Stallworth. *Angiology*, 1960, 11: 495.

The authors trace the usual sequence of events that lead to a consideration of the need of transmetatarsal amputation in patients having arterial insufficiency. They indicate that the best plan for such patients is surgical treatment that is devised to provide excision of infected and necrotic tissue and that attempts at the same time to preserve the maximum of ambulatory apparatus. To this end, transmetatarsal amputation seems to have occasionally provided the advantages sought. The history of the procedure and the literature on the subject of amputation are reviewed.

Fifteen transmetatarsal amputations were performed on 13 patients. In 8 patients the procedure was not worth while, since higher amputation at a later date was necessary. The remaining patients were each left with a comfortable and useful foot. The diabetic patient did not respond as well as did the other patients. Because of the length of hospitalization incident to delayed healing and the number of associated surgical procedures, the authors believe that the benefits from transmetatarsal amputation must be contrasted with the benefits derived from other procedures. They emphasize the need for objective vascular evaluation before any surgical treatment is considered and also mention that their statistics certainly differ from the more promising statistics presented by other authors writing on the subject.

—Einer W. Johnson, Jr., M.D.

MUSCLES AND TENDONS

The Familial and Hereditary Characteristics of Dupuytren's Contracture (Le caractère familial et héréditaire de la contracture de Dupuytren). ROGER DEMERS and JOSEPH-ANTOINE BLAIS. *Union méd. Canada*, 1960, 89: 1238.

DUPUYTREN'S CONTRACTURE is characterized by a fibrous hyperplasia of the palmar fascia and a permanent contracture of one or several fingers of the hand. A similar condition is observed in the plantar fascia, but contractures of the toes have not been observed. About 1 to 2 per cent of the general population is affected by this condition and it usually appears after the age of 40. Men are affected in the ratio of 10 to 1. As the condition is not associated with pain, the exact onset of the disease is very difficult to establish. In 40 per cent of the cases a definite hereditary factor could be established and the author maintains that in the other 60 per cent heredity plays a deciding factor.

It appears that the palmar fascia is replaced by thick, tough, fibrous tissue. As the tissue contracts, it pulls the proximal phalanx where it inserts into a flexed position. The plantar fascia does not insert in the proximal phalanx of the toes and therefore no flexion deformity of the toes occurs. Nodules occasionally appear which later coalesce, forming tough bands. These nodules, called "knuckle pads," are sometimes observed in the dorsal aspect of the metacarpophalangeal joint. It is possible that fibrosis of the corpora cavernosa of the penis, Peyronie's disease, has a similar cause. Many investigators believe that the underlying condition is a premature aging of the connective tissue in the palm of the hand causing the minor tears of the fascia to be repaired by tough, fibrous tissue. Another hypothesis suggests a synergistic action between the sympathetic nervous system and the blood vessels in the region of the hand.

The first state of the disease is characterized by the appearance of the palmar nodules usually at the base of the phalanges. The overlying skin forms a dimple. In the second stage bands of thickened aponeurosis appear. In the third stage the fingers are contracted, and the fourth stage is characterized by the presence of the combined symptoms observed in both first, second, and third stages. The disease is usually not limited to one hand.

Several cases of familial, hereditary Dupuytren's contracture are presented. The characteristic nodules appeared in the hand of a 15 year old girl whose father and mother suffered from Dupuytren's contracture. In some cases it was found that diabetes, tuberculosis, and severe arthritis were associated with Dupuytren's contracture in one family.

The cause of Dupuytren's contracture is still unknown. Several attempts were made to associate it with metabolic and endocrine factors. Several investigators tried to tie it in with the same mechanism as observed in the shoulder-hand syndrome, but closer analysis revealed that these conditions follow different patterns. Local infiltration of cortisone, various other products, the use of high doses of vitamin E, and various physical therapy measures give only temporary improvement. The treatment of choice is surgical excision of the fibrous bands.

—George I. Reiss, Jr., M.D.

Cystic Degeneration of the Tendons (La degenerazione cistica dei tendini). A. BORELLINI. *Chir. org. movim.*, 1960, 49: 285.

THE AUTHOR DESCRIBES 7 cases of cystic disease of the tendons seen at the Department of Orthopedics and Traumatology of the Hospital S.M. Nuova of Reggio Emilia, Italy from 1955 to 1959. Of the 7 patients, 5 were women. The cysts were localized in the dorsal aspect of the wrist, hand, and foot as follows: 2 at the peroneus brevis, peroneus tertius, extensor hallucis, extensor digitorum brevis, extensor indicis communis, extensor medii communis, and extensor of the ring finger. One patient had two tendons involved. In all cases the tendons concerned had a swollen appearance. In 3 of 7 patients the cysts were relatively large, being about 3 cm. in diameter. On histologic examination the cysts had an intratendinous or peritendinous position, were unilocular or multilocular in type, and contained a mucoid material. After surgical removal of the cyst, all patients regained complete restoration of function. No recurrences were observed.

The author stresses the complete benignity of this disease entity and suggests a microtraumatic and degenerative mechanism as the causative factor.

—Maria Serratto, M.D.

The Treatment of Profundus Division by Free Tendon Graft. R. GUY PULVERTAFT. *J. Bone Surg.*, 1960, 42-A: 1363.

DIVISION of the profundus tendon beyond the sublimis insertion may be treated by primary suture when wound conditions permit. If primary repair is not advisable, a secondary suture may be considered if division of the profundus has been close to its attachment. Division proximal to the sublimis insertion is best treated by secondary definitive operation.

The author advises tendon grafting for the index and long fingers for most patients, and for the ring and little fingers only for children and for patients who require more action because of special occupations; otherwise for those who desire a quick result of less perfect nature, he fuses the terminal interphalangeal joints of the ring and little fingers.

The author states that the replacement of divided

flexor tendons by a free tendon graft is one of those essentially personal operations in which only the particular surgeon concerned knows what he can honestly offer to his patient. An analysis of 22 patients consecutively operated on during the years 1942 through 1954 showed that in 86 per cent there was recovery of 30 degrees or more of flexion at the terminal joint. In 50 per cent of the cases there was ability to reach within half an inch or less of the distal palmar crease. Extension was complete in all except 4 of the cases, in which there were flexion contractures of 5, 5, 10, and 20 degrees, respectively. There were no complications in these cases, and in no instance was a finger made worse by operation.

The author prefers the plantaris tendon as a graft and removes it from the leg by means of two incisions. The intact sublimis is never removed unless both it and the profundus are inextricably fibrosed. He makes the proximal anastomosis in the palm, first weaving the small plantaris into the cleft profundus and covering it with lumbricalis muscle. The insertion is made through a transverse hole in the distal phalanx. The fingers are kept in flexion with a view to later splints to obtain extension if necessary. The discussion on his surgical approach, treatment of sheaths, use of suture material, and postoperative supervision should be read in detail.

Of 33 patients, 92 per cent attained 30 degrees of function in the distal interphalangeal joint and 55 per cent attained the ability of the finger tip to reach within half an inch or less of the distal palmar flexion crease. —*Preston J. Burnham, M.D.*

Direct Digital Flexor Tendon Repair. W. K. Lindsay and E. P. McDougall. *Plastic & Reconstr. Surg.*, 1960, 26: 613.

This report of 46 direct long flexor tendon repairs in the digital sheath performed on 40 patients whose ages ranged from 2 to 14 years by Lindsay or by a resident under his direct supervision represents a rather well controlled clinical study. All patients received a general anesthetic, their tendons were sutured with the continuous Bunnell wire suture, and the involved hands were kept in flexion in plaster for 4 weeks. Evaluation of function was not made for 6 months because the authors believe that evaluation short of this time is worthless.

The authors note that the measurement of pulp to palm distance has little meaning because of great variance in hand size, hence they seem to rely more on measurement of joint ranges. They had used the "barbed wire" suture in some cases with good clinical results but abandoned it because of laboratory findings of increased tendon anastomosis distraction.

In the majority of cases, the lacerated sublimis tendon is excised within the limits of the incision. In some cases the digital sheath is unroofed at the zone of the tendon suture, occasionally sacrificing the proximal pulley.

They conclude that 70 per cent of primary repairs and 50 per cent of delayed sutures show good to excellent results and plan no change in their present method of management. They agree with other authors that direct tendon suture produces better results in children than in adults.

—*Preston J. Burnham, M.D.*

Rhabdomyosarcoma in Children. Donald Pinkel and John Pickren. *J. Am. M. Ass.*, 1961, 175: 293.

Rhabdomyosarcoma is generally considered a rare tumor in children. However, during the past 3.5 years, 16 children with this malignant neoplasm have been admitted to the Roswell Park Memorial Institute, Buffalo, New York, 14 of them between January 1959 and March 1960. This frequency ranks it as third among the childhood cancers seen in this clinic, leukemia and neuroblastoma taking first and second places, respectively. The most common site of tumor origin was in the head and neck region, but some arose in the extremities, urogenital system, and trunk. Microscopically, pleomorphism is the rule in the typical rhabdomyosarcoma of adults. In children, rhabdomyosarcoma tends to be truly embryonal, characterized by undifferentiated small round and spindle cells resembling embryonic mesenchyme and occasional elongated cells, some with cross-striations.

Metastases occurred most frequently in lung and bone. In 2 children paraplegia developed from spinal metastases. Other sites of metastases in order of frequency were lymph nodes, pleura, liver, skin, diaphragm, heart, testes, stomach, pancreas, and rectum. Bone marrow aspirations from the anterior iliac crest were performed in 14 children. In 3 patients, tumor cells were present in large number and were readily identified as abnormal. In one of these patients, roentgenograms of the bones appeared normal.

Radical surgery is considered the treatment of choice, but often this is impossible because of the site and extent of the tumor. Chemotherapy with an experimental drug known clinically as actinomycin D or, possibly, with cyclophosphamide is recommended for treating the localized but inoperable lesion in the hope of rendering it operable. Radiation therapy has been considered unsatisfactory in management of this tumor. Radical surgical excision was possible in only 2 patients, in 1 of these only after reduction of tumor size by chemotherapy.

—*C. Fred Goeringer, M.D.*

SURGERY OF THE VASCULAR SYSTEM

BLOOD VESSELS

Stenosis of Carotid Artery in the Neck. JOHN M. MEREDITH and ITALO RINALDI. *Virginia M. Month.*, 1960, 87: 687.

CEREBROVASCULAR ACCIDENTS are often caused by insufficiency due to an arteriosclerotic plaque and a superimposed thrombus beginning at the bifurcation of the carotid artery. Usually the distal intracranial vessels are freely patent. The degree of resultant symptomatology is dependent on the collateral circulation involving the opposite carotid artery, on the vertebral artery system, and on the anatomic pattern of the circle of Willis. A normal circle of Willis seems to be present in only one-third of cases and this significantly influences the success of thromboendarterectomy. The onset of stenosis may be rapid and severe, gradual or spasmodic, or intermittent in character.

If treatment is not instituted, the middle cerebral artery becomes occluded and aphasia and hemiplegia result.

Arteriography is necessary for precise localization of the stenosis. Detection of a bruit or thrill at the bifurcation and reduction in retinal pressure shown by ophthalmodynamometer readings are also important findings. The operation is performed under local anesthesia (cervical plexus block) in order to enable neurologic testing. If temporary clamping of the artery is not tolerated, a shunt becomes necessary from the carotid artery below the stenosis to the internal carotid artery above. If blood pressure is maintained and not permitted to fall, occlusion by clamping of the common, internal, and external carotid arteries is usually tolerable for a period up to 15 minutes. The obstructing plaque is best removed through a transverse arteriotomy. Case reports of 12 surgically treated patients are presented.

—Benjamin G. P. Shafiroff, M.D.

Incidence of Underlying Arterial Lesions in Reconstructive Surgery of the Abdominal Aorta (Incidences des lésions artérielles sous-jacentes dans la chirurgie reconstructrice des anévrismes de l'aorte abdominale). P. WERTHEIMER, J. DESCOTES, and A. SISTERON. *Ann. chir.*, Par., 1960, 14: 1337.

THE AUTHORS discuss the diagnostic and therapeutic problems presented by the association of abdominal aortic aneurysms and lesions of the arteries of the lower extremities. They recommend that every patient with peripheral arterial occlusive disease should have a careful palpation and auscultation of the abdomen to rule out an aortic aneurysm. Aneurysms are usually calcified and so are well outlined by means of a plain roentgenogram of the abdomen, including a lateral view. If the diagnosis of an aneurysm is certain or suspected, the authors recommend a high translumbar aortography (above the renal vessels). This examination is performed primarily to have a good preoperative study of the iliac and femoral vessels. This knowledge permits the simultaneous treatment of the aortoiliac lesions and the peripheral lesions.

The presence of peripheral pulses at the conclusion of the operation should be the objective of the resection of abdominal aortic aneurysms. The authors present 3 illustrative cases. In each case the abdominal aneurysm was resected. In the first case, endarterectomy was performed on both iliacs. On the right side a femoropopliteal bypass was also required. In the second case the resection of the aneurysm and the femoropopliteal bypass were performed in two stages because of the poor general condition of the patient. In the third patient, aortography demonstrated a large saccular aneurysm but failed to give any information about the femoral vessels. Five hours after resection of the aneurysm acute thrombosis of the external iliac and femoral arteries developed, requiring an emergency resection of these vessels and their replacement with a graft.

—Joseph J. Bahuth, M.D.

Surgical Importance of Profunda Femoris Artery. GEORGE C. MORRIS, JR., WILLIAM EDWARDS, DENTON A. COOLEY, E. STANLEY CRAWFORD, and MICHAEL E. DEBAKEY. *Arch. Surg.*, 1961, 82: 32.

ARTERIOSCLEROTIC OCCLUSIVE DISEASE of the lower extremities is characteristically segmental in nature, and the patterns of involvement may be multiple and varied. Combined disease of the aortoiliac and femoropopliteal arteries is frequent. The ideal surgical management should aim to restore normal blood flow to the common femoral and profunda femoris vasculature as well as the distal segments composed of the popliteal and tibial arteries. The preferred technique of the authors for this purpose is an aorta-to-femoral popliteal artery bypass graft in continuity with side-to-side anastomosis in the femoral region between the graft and the common femoral artery.

This ideal type of revascularization, however, may be impossible in cases in which the popliteal, anterior tibial, and posterior tibial arteries are extremely involved by the arteriosclerotic process or even completely occluded, and it may be unwise in patients who do not appear to be suitable risks. Under these circumstances, good, although not ideal, revascularization may be obtained by limiting the distal extent of the bypass procedure to the femoral artery, specifically seeking to restore normal pulsatile blood flow to the profunda femoris artery.

The limited bypass procedure, aorta to femoral artery, was carried out in 102 cases, the indications for the limited procedure being cardiac disease, advanced age, and popliteal-tibial arteriosclerotic involvement. A concomitant limited bilateral lumbar sympathectomy was carried out if this had not already been performed.

Satisfactory revascularization was obtained in 82 per cent of patients and, of these, 40 per cent developed pedal pulses despite uncorrected occlusion of

the superficial femoral artery. Ten per cent of the patients were classified as having a fair result because of persistent claudication or a subsequent necessity for late femoral-to-popliteal bypass graft. Poor results were obtained in 8 per cent as reflected by amputation in 4 and operative mortality in 4.

Three factors appear to contribute to satisfactory results in patients in whom occlusion of the superficial femoral or popliteal artery cannot be corrected: (1) Comparatively minimal arteriosclerotic involvement of the deep femoral artery; (2) a rich bed of previously developed collaterals between the deep femoral artery and the distal popliteal tibial segments; and, (3) added benefits through concomitant lumbar sympathectomy. —*Wayne F. Cameron, M.D.*

Surgical Treatment of Obstructive Lesions Caused by Arteriosclerosis (Cirugía directa de las lesiones obstructivas producidas por la arterioesclerosis). RUBEN JAEN CENTENO, MIGUEL ANGEL ORTEGA, and VICTOR GROSSMANN SIEGERT. *V Congr. venezolano cirug.*, 1960, 1:307.

THE RESULTS of the study and treatment of 114 patients afflicted with arteriosclerosis obliterans are presented. Technical considerations are given regarding the femoral arteriograms and translumbar aortograms, the authors using local anesthesia in both examinations. The authors insist on good visualization of the arterial tree in order to make possible a correct diagnosis.

The surgical technique for aortoiliac endarterectomy and replacement of those vessels by plastic prostheses is described. The results of 6 aortoiliac thromboendarterectomies and 6 bifurcation grafts, 4 of dacron (Baylor) and 2 of nylon (Edwards-Tapp) are presented. Two cases of aortic abdominal aneurysms treated by resection and replacement by a dacron prosthesis are presented. The results were satisfactory in spite of the fact that one of the cases was an emergency due to rupture.

The results in 6 cases of obstruction of the superficial femoral artery treated with bypass of plastic material are commented on. Tardy thrombosis after 5 to 9 months was observed with the nylon prosthesis. The patients treated with dacron prostheses had better results. Only time will tell if the endarterectomy is superior to the bypass.

The authors have absolute confidence in the satisfactory results obtained in the aortic operation utilizing a prosthesis of plastic material. In spite of the inevitable initial obstacles—these operations are the first performed in South America—the results can be compared favorably with the others. Naturally, once the equipment has been perfected and the secondary personnel better trained to this new type of surgery, better results may be expected.

—*Luis A. Díaz-Bonnet, M.D.*

Evaluation of Venous Shunting Procedures for Portal Hypertension. GERALD W. PESKIN, RONALD B. BERGGREN, and ROBERT W. CRICHLOW. *Surg. Clin. N. America*, 1960, 49: 1551.

THE ONLY CONVINCING DEMONSTRATION of the value of surgical procedures in the treatment of portal hypertension would be a matching study of patients chosen at random for medical treatment alone and for surgical therapy. To date this has not been accomplished, although MacPherson has come closest to the ideal in comparing his series of patients treated surgically with the cirrhotics treated medically by Douglass and Snell at the Mayo Clinic. This study showed a statistically significant difference in survival between the 2 groups in favor of the surgically treated patients at 1 year after operation but not in the later follow-up study at 3, 5, and 7 years.

Diverting of portal blood from the liver in normal dogs is followed by liver atrophy, lessened ability on the part of the liver to regenerate, "meat intoxication," and depression of hepatic function, most notably a decreased ability to synthesize albumin. The present study and others have been carried out to determine whether in the human being with a cirrhotic liver the same untoward sequelae pertain.

From other studies and their own the authors may conclude that operation always has an immediate adverse effect on the function of the cirrhotic liver, but that the severity of the additive burden depends much more on the condition of the liver at the time of operation than on the type of operation performed, emphasizing the importance of preoperative preparation of the patient. Moreover, if the patient survives the immediate postoperative period, the liver recovers and appears to regain a functional capacity little, if at all, inferior to what it had before operation.

Coupled with survival and maintenance of liver function in the cirrhotic with portal hypertension is the problem of recurrent hematemesis. It is evident that the only certain aspect about bleeding in portal hypertension is its unpredictability. Baker and his co-workers have recently demonstrated this in their analysis of over 100 patients with proved varices who had not bled at the start of the investigation. However, Palmer and associates compared the incidence and severity of bleeding in a group of 57 patients treated by shunting and a control group of 48 patients for whom operation had been recommended but was not performed. They assessed severity of bleeding by comparing the amount of blood necessary to sustain life in each group over a control period. The difference in both the incidence and severity of bleeding distinctly favored the group treated surgically. Most large series reveal that only 1 in 10 or more patients experience postshunt bleeding.

In view of these findings there appears to be justification for continued surgical efforts in the control of bleeding varices secondary to portal hypertension, especially when this brings forth objective data for later comparison and evaluation.

—*John J. Maloney, M.D.*

An Evaluation of the Sphygmomanometer Cuff Pain Test in Venous Thrombosis. HENDRICK B. BARNER and JAMES A. DEWEESE. *Surgery*, 1960, 48: 915.

BECAUSE of the frequency of pulmonary emboli from the veins of the legs and the lack of clinical signs in the extremities in many patients, the authors undertook in 3 groups of patients a study of the sphygmomanometer cuff pain test as described by Lowenberg. Group 1 members were routinely hospital admitted patients examined to determine the value of the test

in predicting venous thrombosis, group 2 consisted of postoperative patients tested for the early diagnosis of thrombosis, and group 3 members were patients in whom the status of the deep veins was known by means of phlebograms and who were given the pressure pain test to evaluate its role in the correct diagnosis of venous thrombosis.

Eleven of 230 patients tested in group 1 showed a positive response—tolerances of less than 150 mm. Hg pressure of the cuff about the calf—but a known venous thrombosis developed in none while in the hospital. One hundred four of 107 patients in group 2 were operated upon. Superficial phlebitis developed in 9 of these patients, but in no case did the test assist in early diagnosis of deep venous thrombosis. In group 3 patients there were 50 extremities studied by phlebography, in 23 of which deep venous thrombosis was present. Fifteen of the involved extremities were positive to the test, but in 5 (22 per cent) the results were falsely negative. In 7 of the 27 patients without thrombosis the results of the test were falsely positive.

A careful examination for tenderness of the calf provided the most reliable clinical sign for deep venous thrombosis. In some patients with equivocal tenderness, a positive pressure pain test on one leg with a normal response on the other may assist in the correct diagnosis of thrombosis.

—*Albert M. Schwartz, M.D.*

Superficial Phlebitis of the Upper Extremity (Phlébites superficielles du membre supérieur). LUCIEN LEGER and ANDRÉ ZIPPER. *Presse méd.*, 1960, 68: 2033.

THIS REPORT is based on 4 cases of superficial phlebitis of the upper extremity observed at the Surgical Clinic of the Hôpital Cochin, Paris, France. These clinical observations, supported by histologic proof in 3 cases, are considered to be extrathoracic localizations of string or cord phlebitis described by Mondor in 1939. Mondor's original report described the involvement of the thoracoepigastric vein. Since then, superficial phlebitis has been recorded in other areas, chiefly in the lower and upper extremities. It is a disease of adulthood, equally present in both sexes.

Trauma, most often a mastectomy or other surgical intervention on the breast, precedes the onset of the disease. Pathologically, the disease is a superficial endophlebitis with marked tendency to obliteration and thrombosis without periphlebitis. The clinical picture consists of a first stage of mild discomfort, light or vague pains, and a sensation of skin tightness in the involved area, which lasts for 2 to 4 weeks, followed by the stage of frank disease when a subacute phlebitis can be easily detected. A superficial linear, hard, almost painless cord made prominent by full extension of the elbow, when located in the cubital fossa, can be readily palpated. The cord is adherent to the overlying skin but free from the underlying structure. There is a moderate discomfort, limitation of the extension of the forearm, and absence of redness and edema. Occasionally, a small, mobile axillary lymph node, without cutaneous reaction can be palpated.

These findings pertain to the localized variety of the disease, in the cubital fossa or in the deltopectoral groove. The extensive form of the entity involves venous channels extending from the wrist to the axilla. In these cases a long, thin, almost painless structure can be palpated along the plane of flexion of the extremity. The classical thoracoabdominal variety has been occasionally associated with a superficial phlebitis of the upper extremity. Systemic signs and symptoms are minimal or nonexistent. The disease is a self-limiting thrombophlebitis, requiring no treatment. Recovery is the rule in 8 to 10 weeks. The authors believe that excision of the segment of the vein involved hastens recovery.

—*Michele A. Chiechi, M.D.*

Continuous Uninterrupted Compression Technique of Injecting Varicose Veins. W. G. FEGAN. *Proc. R. Soc. M.*, Lond., 1960, 53: 837.

IN THIS AUTHOR'S OPINION the correction of varicosis of the leg veins depends on permanently obliterating sites of reflex filling through incompetent veins which allow the deep veins to empty into the superficial. The removal of visible varices is a secondary consideration. To accomplish his main purpose he carefully localizes the incompetent communicating veins by palpating defects in the fascia of the leg and by observing patterns of filling of varices. He injects sclerosants into only those veins, after emptying them, and maintains compression of the injected segment until the injured apposing intimal surfaces seal the vein. That prevents formation of a thrombus which can be canalized.

The Hunterian communicating vein above the medial femoral condyle deserves special attention.

This treatment is used in all cases during pregnancy and at other times. Varices which appear after deep thrombophlebitis fare as well as primary varicosis with this treatment. —*Leonard D. Rosenman, M.D.*

Bacterial Aneurysms in the Extremities (Aneurismas bacterianos de las extremidades). GUILLERMO BUZZI. *Sem. méd.*, B. Air., 1960, 67: 275.

BACTERIAL ANEURYSMS are produced as a result of bacterial endocarditis and less frequently by other infectious processes.

The treatment of these aneurysms of the extremities should be surgical if the general condition of the patient permits it. Operation should consist of excision of the aneurysmal sac with re-establishment of the continuity of the artery.

Three bacterial aneurysms successfully operated on in 2 patients are reported.

—*Luis A. Díaz-Bonnet, M.D.*

BLOOD AND TRANSFUSIONS

Operation upon Patients with Hemophilia (Chirurgische Erfahrungen bei Haemophilen). K. H. HERZOG. *Münch. med. Wschr.*, 1960, 48: 2396.

INVESTIGATION of blood coagulation unveils more and more coagulation defects which lead to the clinical symptoms of hemophilia. Babies and small children are particularly endangered by the disease, whereas after 25 to 30 years of age the hazard diminishes. Minimal trauma can cause retrobulbar hematomas and blindness. Excretion of blood clots resulting from chronic recurrent hematuria may cause renal colic. Pharyngeal, laryngeal, and submaxillary hematomas can lead to asphyxia.

The author, of the surgical and orthopedic department, University of Jena, Germany, has observed a 9 year old boy with known hemophilia A who had ankylosis of the left knee joint and hemarthrosis of the right cubital joint. Without any known trauma, a submaxillary hematoma developed which extended rapidly, causing critical compression of the airway. An emergency tracheotomy relieved the obstruction but the patient died half an hour after operation due to a hematoma in the operating field.

Extensive subcutaneous hematomas should always be treated with antibiotics since infections are very prone to develop in these cases. The author reports the case of a 6 year old boy with known hemophilia A in whom a large hematoma of the head developed. Under conservative treatment it became infected and septicemia followed. Incision and evacuation of the hematoma could not prevent the fatal outcome 20 hours postoperatively.

The complications and consequences of chronic intra-articular hemorrhage leading to fistulas, severe deformities, ankyloses, and contractures are well known. In contractures good functional results can be obtained by conservative management. The cases of a 36 year old male and a 5 year old boy with severe contractures of the knee joints are briefly described. Good functional results were obtained by conservative measures in these patients.

Finally, the author reports a successful amputation of the femur in a 19 year old male with known hemophilia A who had an infected hemarthrosis of the right knee joint. The infection extended rapidly and necessitated amputation. Postoperatively several episodes of critical hemorrhage occurred. Wound infection also developed. After 226 days of hospitalization the patient was discharged with a healed wound.

The author emphasizes that individuals with hemophilia should be studied thoroughly at an early age and followed up throughout their lifetimes. Operation should be avoided whenever possible. Should it become necessary, cooperation with hematologists will be essential. —*Erwin Simandl, M.D.*

Effects of Long Term Storage on Human Serum Albumin—I, Chromatographic and Ultracentrifugal Aspects. J. S. FINLAYSON, RICHARD T. SUCHINSKY, and ANN L. DAYTON. *J. Clin. Invest.*, 1960, 39: 1837.

THIS ARTICLE from the Department of Health, Education and Welfare, National Institutes of Health and the Division of Biologics Standards reports on changes in the serum albumin stored over a prolonged period. The primary methods of checking changes in the protein fraction of the stored albumin were chromatography and subsequent ultracentrifugation.

Albumin prepared from citrated whole plasma and stored for 5 years at 5 degrees C. showed minimal difference in chromatographic behavior from fresh albumin samples. Those stored for 10 years, or stored at 32 degrees C. or prepared from ultraviolet irradiated dried plasma demonstrated more marked differences on chromatography.

The authors state that, in this study, co-ordinated use of both chromatography and ultracentrifugation provides an extremely sensitive method of detecting protein alteration. Subsequent publications from this group will report the study of stored albumin using electrophoresis, viscosity, and other methods.

—*Ward D. O'Sullivan, M.D.*

SURGICAL MANAGEMENT

PREOPERATIVE AND POSTOPERATIVE CARE

Preoperative Treatment of Thyrotoxicosis with Antithyroid Drugs and Thyroxine. GÖSTA BERGFELT, JAN-GUSTAF LJUNGGREN, and KERSTI HEDBERG. *J. Clin. Endocr.*, 1961, 21: 72.

THE PREOPERATIVE MANAGEMENT of 467 patients undergoing thyroidectomy is discussed. There were 5 regimens employed. In group A, 237 patients were treated with iodine; in group B, 121 patients were treated with antithyroid drugs plus iodine; in group C, 47 patients were treated with antithyroid drugs plus thyroxine; in group D, 5 patients were treated with antithyroid drugs plus iodine plus thyroxine; and group E consisted of 57 patients with nontoxic goiter who served as controls. The operative technique in all patients was the same.

It is postulated that some substance is circulating in the blood of patients with thyrotoxicosis, regardless of the level of circulating thyroid hormone. Thyroid stimulating hormone (TSH) is depressed. When antithyroid drugs are administered, circulating thyroid hormone is depressed and the level of TSH increases, causing an enlargement of the gland.

In this study, thyroxine added to the treatment with antithyroid drugs prevented the enlargement of the gland. The patients were maintained in a euthyroid state during the administration of the antithyroid drugs. The variations in the size of the gland with different forms of treatment are discussed.

—*John H. Davis, M.D.*

Preoperative and Postoperative Management of Patients with Impaired Pulmonary Function. GEORGE J. HAUPT and RUDOLPH C. CAMISHION. *Surg. Clin. N. America*, 1960, 40: 1477.

PULMONARY COMPLICATIONS are not infrequent in the postoperative patient. Their incidence has been found to be as high as 42 per cent in patients who have been operated upon for biliary tract disease. In upper abdominal operations the vital capacity may be decreased as much as 60 per cent. Full oxygenation is attained under these circumstances by increasing the respiratory rate. Nonaerated segments of the lung may trap circulating bacterial organisms.

The authors separate pulmonary functional impairment into two types. The first is direct pulmonary impairment in which there are changes in the structure and function of the pulmonary tissue itself. In the second or indirect type there is no involvement of the pulmonary tissue itself. In this latter group one is dealing with problems of distribution of respired gases and defective pulmonary capillary blood flow.

In evaluating pulmonary function the authors stress the importance of the past history, physical examination, and the application of some rather simple pulmonary function tests, such as ability to climb stairs.

In the preoperative preparation attention should be directed to various degrees of bronchial obstruction, infection, and bronchospasm. They suggest the use of intermittent positive pressure breathing apparatus with bronchodilating agents. They demonstrated that the use of the positive pressure apparatus alone may diminish the total vital capacity, but its use with bronchodilators increases the vital capacity.

Postoperative atelectasis frequently results from obstruction of a bronchus by thick mucus. Maintaining adequate hydration, high humidity in the atmosphere, and administration of expectorants may help prevent the development of atelectasis. Nasotracheal aspiration may be employed either to prevent or to treat the development of postoperative atelectasis. The use of tracheostomy may cut down on the dead space by one-half and increase alveolar ventilation. The authors suggest the use of slight positive pressure to prevent the development of atelectasis by the use of either a "blow bottle" or a long tube.

By giving special attention to pulmonary function both preoperatively and postoperatively, the incidence of pulmonary complications can be decreased considerably.

—*Richard L. Lawton, M.D.*

Emergency Airway. THEODORE H. NICHOLAS and GEORGE F. RUMER. *J. Am. M. Ass.*, 1960, 174: 1930.

THE AUTHORS BELIEVE that many physicians as well as laymen would be unable to treat airway obstruction in emergency situations. In teaching tracheotomy techniques on animals to physicians, nurses, dentists, and veterinarians, it became evident that a number of mistakes occurred which would have resulted in fatalities in the human patient with obstruction.

A plan of action for the management of airway obstruction is outlined as follows: (1) Recognition of signs and symptoms of airway obstruction; (2) nonsurgical maneuvers to relieve obstruction, such as proper positioning of the patient and removal of foreign bodies; (3) positive pressure breathing; and (4) establishment of a surgical airway.

Incision of the cricothyroid membrane is deemed the best method of establishing an airway because the approach is avascular, the membrane is easily identifiable, the airway may be maintained even without a tube because of the subcutaneous location of the membrane, and chances of posterior laryngeal perforation are minimal. The disadvantages include trauma to the laryngeal soft tissues and laryngeal stenosis; hence, the authors advise low tracheostomy as soon as possible.

Needle puncture of the larynx or trachea is condemned because the flow through a needle may be inadequate to maintain life. The methods of incision of the cricothyroid membrane, tracheostomy, and emergency airway aftercare are outlined.

The authors conclude that emergency tracheotomy should be performed only by skilled surgeons with proper equipment and that under adverse circumstances, cricothyroid membrane incision is the simplest way to establish a surgical airway.

—*Richard E. Gardner, M.D.*

Oliguric Renal Failure of Surgical Origin. RALPH SHACKMAN, M. D. MILNE, and N. W. STRUTHERS. *Brit. M. J.*, 1960, 2: 1473.

THE AUTHORS PRESENT the experience gained from the management of 106 patients with renal failure of surgical origin. There were 4 patients with prerenal disease and 23 patients with postrenal disease, or a total of 27 patients with an extrinsic cause of the renal failure. There were 79 patients in which the cause of renal failure was determined to be intrinsic in the kidneys.

The intrinsic renal failure followed operation in 50 instances and accidental trauma in 29. The pathologic lesions in this group of patients were acute tubular necrosis in 77 cases and cortical necrosis in 2.

In the group of patients with postrenal obstruction hemodialysis was not required. The causes of renal failure in this group of patients were malignant disease, urinary calculi, retroperitoneal fibrosis, and surgical operations. Seventeen of the 24 patients with postrenal obstruction responded satisfactorily to surgical and drug therapy.

The renal lesion in the 50 patients with acute intrinsic renal failure was associated with peritonitis in 25, hypotension in 14, and infection other than peritonitis in 7. The remaining 4 cases were associated with such things as renal vein thrombosis and intimal stripping of the aorta at the time of aortography. Twenty-five of these patients underwent hemodialysis, some of them on several occasions. Only 8 of these patients survived to leave the hospital, but many of them died of an associated complication rather than from the renal failure.

Seven of the 29 patients with posttraumatic acute intrinsic renal failure survived to leave the hospital. Hemodialysis, often multiple, was performed in 16 of the 29 patients.

Several case reports are included in the paper.

—John H. Davis, M.D.

The Practical Application of Intestinal Antisepsis to Surgery of the Colon and Rectum. EDGAR J. POTH. *Dis. Colon & Rectum*, 1960, 3: 491.

THE PRACTICAL VALUE of intestinal antisepsis as a simple procedure has been established with fair certainty during the past few years. It is believed that neomycin and sulfathalidine in combination are the agents of choice at present.

One view of some of the considerations in selecting the agent to produce a clean, relatively antiseptic large bowel is given. A detailed program of the steps employing neomycin and sulfathalidine is given. In this program, patients are divided into 3 types, those in whom no obstruction at all is present and purgation is possible; those in whom there is partial obstruction; and finally, those in the situation of a more emergent nature in which there is complete obstruction of the large bowel or an acute condition of the abdomen.

A series of 215 patients with carcinoma of the colon in whom primary open anastomosis was performed is presented. Also reported is the mode of preparation of the bowel and the minimal complications encountered when neomycin and sulfathalidine are employed.

A final matter discussed is the theory that implantation of neoplastic cells might be augmented when bacterial growth is reduced. It is thought that this is a minimal risk and that the employment of half strength Dakin's solution to irrigate the bowel at the time of an anastomosis would offset any such possibilities.

—Robert W. Williams, M.D.

WOUNDS AND THERMAL INJURIES

Burn Therapy—I, Concealed Progress Due to a Shifting Battlefront. ANNE WIGHT PHILLIPS and OLIVER COPE. *Ann. Surg.*, 1960, 152: 767.

THE PURPOSE of this study was to examine the possibility that severely burned patients today may be surviving hazards, such as shock, that would have killed them 15 years ago, only to succumb to dangers as yet uncontrolled. Deaths from burns tend to follow a timetable. There is an initial high mortality rate during the first 2 or 3 days, the shock phase; next a breathing spell of a few days; and then a second period of peril, which lasts 3 to 5 days.

The average survival time in lethal burn injuries has more than tripled in recent years. In the period from 1939 to 1947 the average patient admitted with fatal burns survived only 5 days. In a more recent period, from 1948 to 1957, the average survival time increased to 16 days. Nearly half of the deaths due to burns occurred during the shock phase. In 37 per cent of the fatal cases in the early period the patient was dead by the forty-eighth hour after injury, whereas there was a fatality rate of only 18 per cent during the shock phase in the period from 1948 to 1957. Deaths in the phase of resorption of edema—3 to 5 days after injury—dropped 17 per cent during the 1948 to 1957 period. Three of the 51 fatally burned patients in the 1939 to 1947 period were living at the beginning of the third week, whereas 14 of the 50 fatally burned patients in the later period survived that long.

Survival time after burns has increased in recent years for all patients less than 56 years of age.

In the 1939 to 1947 period the time of death showed a high correlation with the severity of burn injury, as indicated by the extent of third degree burn. This close relationship between survival time and extent of third degree burn was not present in the 1948 to 1957 period.

—Stephen W. Carveth, M.D.

Adrenal Medullary Insufficiency in Severe Thermal Burn. McC. GOODALL and B. W. HAYNES, JR. *J. Clin. Invest.*, 1960, 39: 1927.

IT HAS BEEN OBSERVED that there is an increase in the production of adrenalin under stressful situations. Noradrenalin, a neurohormone of the sympathetic nerves, is released in greater quantities during stress. It has also been observed that the adrenal medulla synthesizes adrenalin very rapidly. The output of these hormones and their metabolic products was measured in the urine.

This is a study of 14 severely burned patients who ultimately died. While they were yet alive, serial studies of 24 hour urine outputs were made for adrenalin content. At the time of death the adrenal glands were removed and colorimetric assay accomplished. On analyzing the data, three different groups were discerned. Group A comprised those patients who

had a low to normal adrenalin output with normal adrenalin content of the gland. Group B had a high adrenalin output with low adrenal gland content of adrenalin. The last group had a low output and a low adrenalin content of the gland. The severity of the burn was considered to be less in the first group than in the last group of patients. About three-fourths of the patients were in the last group or Group C, and these were the most severely burned patients. These were the patients with low adrenalin output and low adrenalin content of the adrenal gland. This situation suggests acute medullary insufficiency.

Since the adrenal has considerable reserve, the reason for the development of adrenal medullary insufficiency in these patients was sought. It was suggested that the absence of precursors of adrenalin might lead to adrenal insufficiency. Hepatic damage is not uncommon in burned patients and the synthesis of phenylalanine and tyrosine may be disturbed.

If the resynthesis of adrenalin is insufficient, the action of adrenalin on vital centers is diminished and may contribute to death in the patient under severe stress. —*Richard L. Lawton, M.D.*

Renal Shut-Down After Burns and Treatment with Extracorporeal Dialysis (Das Nierenversagen nach Verbrennungen und seine Behandlung mit der extrakorporalen Dialyse). WOLF-EBERHARD GOLDHAHN. *Zbl. Chir.*, 1960, 85: 1983.

THE AUTHOR first gives a summary of the important electrolyte and fluid changes that follow a severe burn. The kidney is in a key position during these events. Renal function can be disturbed by alterations in electrolyte metabolism and by shock. The latter is probably caused by vasospasm transmitted by the nervous system and is followed by tubular necrosis. It is as yet unknown if nonspecific protein metabolites play any significant role. A constant microscopic finding in such kidneys is pigment casts in the tubuli. They consist of chromoproteins which permeate the damaged tubular wall.

Better understanding of the electrolyte and fluid balance has decreased the incidence of anuria. Factors important for the prognosis are time of diagnosis, age of the patient—in young and old patients the mortality is the highest—and availability of extracorporeal hemodialysis, which should be performed within 24 to 36 hours after the onset of anuria. Prevention of anuria, however, is still the best procedure.

Two illustrated case reports and a table of the normal hourly urine volume are given.

—*Eckhard Fischer, M.D.*

INFECTIONS AND ANTIBIOTICS

Staphylococcal Wound Infection in Selected Surgical Procedures. H. TAYLOR CASWELL, KENNETH M. SCHRECK, and W. EMORY BURNETT. *Surg. Clin. N. America*, 1960, 40: 1469.

THE INCIDENCE of staphylococcal infections in 16 operative procedures divided into four groups totalling 7,691 operations has been presented. The cases in each of the 4 groups were in general of a similar nature. All the infections were caused by coagulase-positive staphylococci.

The results of this study have shown a basic staphylococcal infection rate of 0.97 per cent in clean surgical wounds, which the authors believe can be interpreted as being due to contamination by the external environment during the operation.

Significant increases in this basic wound infection rate occur when tissues normally supporting staphylococcal growth are involved in the operative procedure or when prolonged postoperative drainage is required. Improvement in the wound infection rates in the latter group requires alterations in surgical technique and in preoperative and postoperative care.

The study also emphasizes the fact that staphylococcal wound infection rates must be calculated on the basis of specific operative procedures rather than on the over-all wound infection rate if the true extent of the problem is to be realized.

—*Ely Elliott Lazarus, M.D.*

A New Technique for the Control of Hospital Cross Infection. S. D. ELEK and P. C. FLEMING. *Lancet*, Lond., 1960, 2: 569.

THE NASAL CARRIAGE RATES in normal people combined with the confined conditions in a hospital lead to a buildup of staphylococci in the surroundings. In turn, the noses of fresh individuals then become colonized and void more staphylococci into the air and dust. This would appear to be the fundamental cycle of staphylococcal infection within a hospital and represents the epidemiology of cross infection. The introduction of antibiotics has not abolished this cycle, but has tended to eliminate the drug sensitive organisms. In general, if this cycle can be broken, such as occurs after the closing of a ward which has had a high infection rate, the problem can be controlled for some period of time.

These authors studied 400 strains of Staphylococcus pyogenes and found that they are sensitive to concentrations of 1.5 to 3 mcgm./ml. of BRL1241. Attempts to produce naturally resistant strains with gradient plates were unsuccessful, so that the possibility of resistant strains developing would appear to be unlikely.

Because of the unique properties of BRL1241, the authors decided to test the effect of spraying a ward daily with this compound, aerosolized through a spray device, in the hope that the droplets would be active and would eliminate the resistant staphylococci from the noses of personnel and from the surroundings in a ward. These studies were carried out in two obstetric wards, one serving as a control and the other being sprayed at particular intervals of time.

Spraying of BRL1241 into the air was shown to prevent the usual acquisition of pyogenic staphylococci by newborn infants.

The spraying produces droplet nuclei of the drug which circulate in the air in the same way as the microorganisms. The authors found that it was possible to break the cycle of staphylococcal circulation by this means at its focal point—the nasal reservoir.

Limited observations on the mothers of the newborn infants suggest that the colonization of their noses by resistant staphylococci may be controlled by the spray technique. The suggestion is made that this may provide a satisfactory tool for further study of this problem. —*John H. Davis, M.D.*

Colistin, Analysis of a New Antibiotic in 44 Cases of Systemic Gram-Negative Bacterial Infection. JAMES W. HALL. *Am. J. M. Sc.*, 1960, 240: 561.

COLISTIN, a new complex polypeptide antibiotic, was administered to 54 patients with infections due to gram-negative bacteria, in doses of 75 mgm. per day, given in 2 or 3 daily intramuscular injections. Only 5 patients had undesirable side effects. Two of these had pain at the injection site with large doses, 1 had slight vertigo with one injection, 1 had a sensation of circumoral paresthesia, and 1 patient with obstructive uropathy had a temporary increase in azotemia.

The antibiotic was effective in 67 per cent of the 44 patients satisfactory for analysis. Most of these patients, 86 per cent, had urinary tract infections. The most common organisms involved were pseudomonas, Escherichia coli, and proteus. Most patients had had treatment failure with other antibiotics. In vitro studies verified the susceptibility of Pseudomonas and the relative resistance of proteus to this antibiotic. Colistin was ineffective against staphylococcus and streptococcus. —*Stanley W. Tuell, M.D.*

Clinical and Laboratory Experiences with a New Synthetic Penicillin, 2,6-Dimethoxyphenyl Penicillin. ARNOLD BRANCH, K. C. RODGER, R. W. LEE, and EDNA E. POWER. *Canad. M. Ass. J.*, 1960, 83: 991.

NEW SYNTHETIC PENICILLINS are now becoming available as a result of the discovery by Batchelor of 6-aminopenicillanic acid, the parent nucleus of all penicillins. The latest of these, 2, 6-dimethoxyphenyl penicillin or staphcillin, exerts its action against staphylococci irrespective of the organism's ability to form penicillinase. Staphcillin is bactericidal and its spectrum has been found to be similar to that of penicillin G. However, when tested on staphylococcal organisms that are sensitive to penicillin G, the penicillin G is three to five times more effective than staphcillin in vitro. Staphcillin is pharmacologically nontoxic, nonirritating, and readily absorbed after intramuscular injection. It may also be safely administered intravenously in large doses. Although the drug is not appreciably altered by penicillinase, staphcillin is a very effective inducer of penicillinase. Staphylococci have been made resistant to staphcillin by repeated exposure and development of mutants. This development of resistance does not depend on penicillinase production.

The authors report on laboratory findings with staphcillin used in the treatment of 12 patients with staphylococcal infections. Of the 35 strains of coagulase-positive staphylococci isolated from human lesions, all were sensitive to staphcillin in a range from 0.39 to 3.12 mcgm./ml. Many of these strains were highly resistant to penicillin G. However, the degree of sensitivity of some of the strains most sensitive to penicillin G was less than that to staphcillin. The dosage of staphcillin used in treating these patients varied from 0.5 to 1 gm. every 4 hours to 1 gm. every 6 hours intramuscularly. Excretion is rapid and occurs mainly in the urine. No significant toxicity was encountered in 12 patients. Clinical response was rapid, occurring in 24 hours. In 9 of the 12 cases, the infecting organism was resistant to penicillin G. Only one strain of staphylococcus has as yet been reported resistant to this drug, and the question of developing resistance remains to be established. —*Alan Thal, M.D.*

HYPOTHERMIA

Experimental Investigation and First Clinical Experiences with Profound Hypothermia (Experimentelle Untersuchungen und erste klinische Erfahrungen bei Anwendung tiefer kuenstlicher Hypothermie). K. SPOHN, E. KOLB, J. HEINZEL, and R. KRATZERT. *Thoraxchirurgie*, 1960, 8: 228.

THE AUTHORS first report their animal experiments on hypothermia with surface cooling to about 20 degrees C. by means of immersion in an ice-water bath. All experiments were performed with the animals under deep ether anesthesia, stage III, plane 2-3. Ventricular fibrillation occurred twice in 78 experiments during cooling and regularly on cardiac massage (up to 84 minutes) utilized to restart the heart after circulatory arrest; it could be converted into sinus rhythm in all but 17 dogs by means of electrical defibrillation. The hematocrit, hemoglobin, and red blood cell count remained constant. During the cooling period blood coagulability increased. On rewarming, considerable amounts of heparin are released and can cause a marked increase in clotting time.

The authors believe that at temperatures of less than 28 degrees C. deep anesthesia is needed in order to suppress all counterregulatory effects such as cardiac arrythmias during the cooling period. Proper anesthetic management can prevent all cardiac, circulatory, and metabolic changes commonly ascribed to hypothermia. The depth of anesthesia should be easily controllable. The authors claim that inhalation anesthesia is required for that purpose. Below 28 degrees they adjust the depth of the anesthesia according to the electrocardiogram by keeping the plane of anesthesia at the point at which extrasystoles and nodal rhythm have just disappeared, which represents stage III, plane 2-3. The authors rely on the observation of the classical signs of ether anesthesia which reappear upon rewarming to prove that they have kept the patient in plane 2-3 of the third stage of ether anesthesia.

The method has been applied to 6 patients. One of them, a 7 year old girl, had an ostium secundum type of defect. Her temperature was lowered to 23.2 degrees C. and the circulation was arrested for 10 minutes. The procedure was well tolerated. Three children, 4 years, 6.5 years, and 2.5 years of age, with tetralogy of Fallot were cooled down to 19.7, 20.2, and 19.8 degrees, respectively. Circulation was arrested for 20 and 23 minutes in the 6.5 and the 2.5 year old children. In the 4 year old the defect could not be repaired and circulation was not arrested. It died of pneumonia 3 days after the operation. The other 2 died of pulmonary edema at the conclusion of the operative procedure. There was 1 patient who had Ewing's sarcoma of the chest wall. His temperature was lowered to 20.7 degrees C. and a chest wall resection was carried out. The patient recovered and remained well. A 58 year old male with carcinoma of the esophagus was cooled to 24.5 degrees C. and the esophagus resected. The patient died 3 days

postoperatively of pneumonia. Ventricular fibrillation, which had been observed in dogs upon restarting of the heart, did not occur in the human patients. The authors believe that their animal experiments prove the safety of hypothermia of about 20 degrees C. induced by their technique in which no pump is used. —*Erwin Simandl, M.D.*

Deep Hypothermia with Extracorporeal Circulation in Open Heart Surgery (Die tiefe Hypothermie mit extrakorporalen Kreislauf in der offenen Herzchirurgie). VIKING OLOV BJÖRK. *Thoraxchirurgie*, 1960, 8: 271.

IN 1959, DREW described a method of perfusion whereby deep hypothermia was used in open heart surgery without an oxygenator. After the usual cannulation in the femoral artery and right atrium, perfusion was accomplished by cooling blood from the left atrium, which was led into a reservoir by means of gravity. The perfusion was partial, from 200 to 1,000 c.c. of blood being used per minute. In this procedure ventricular fibrillation can be expected at a temperature between 30 and 16 degrees C., but usually occurs when the temperature in the esophagus is 20 degrees C. When two pumps are utilized, the blood, according to the Heber principle, flows from the right atrium into a separate reservoir and from there into the pulmonary artery. Perfusion with both pumps requires a lead on the volume of about 50 c.c./kgm. of body weight per minute.

The author sought to lower the temperature below the levels used by Drew. The lowest temperature obtained was 7.5 degrees C. in the esophagus of 1 patient. The circulation was stopped for a period of 47 minutes without damage. By lowering the temperature at a faster rate it was found that both arterial and venous blood remained well saturated with oxygen. It was possible to obtain an empty and relaxed heart suitable for repair. If the heart failed to respond when the temperature was raised to 30 degrees C., an electric stimulus was used.

In Uppsala, an oxygenator with rotating blades is utilized. A smaller oxygenator was used for animal experiments. In these experiments the oxygenator was exchanged with the heat exchanger, still using the same pumps and filter. This experiment led to a smaller hemolysis. The most interesting finding was the decrease in the number of thrombocytes and white cells during the cooling, the number returning to normal during the warming. The pumps used work on a roller principle, and it is important that the blood volume in both reservoirs remain at the same level.

A case with several illustrations is reported in order to demonstrate the method outlined. Of a group of 10 patients operated upon 4 died. One of these had peripheral pulmonary stenosis. It was suspected that the oxygen consumption at 10 degrees C. was less in the adult than in the child because of the reduced anoxia tolerance in children. In order to prolong the period of anoxia, a slow retroperfusion was attempted in order to utilize the oxygen present in the entire system. This action had two effects: the lowering of the risk of thrombosis by the mixing and the coverage of low oxygen demand by cooling. Deep hypothermia in children may cause cerebral damage, and hence the author believes it to be contraindicated in children. The perfusion method is ideally suited for operation on the aortic valve. The author believes that hypothermia is not the method of choice in treating most of the remaining congenital or acquired defects. These would be best treated by the use of the heart-lung machine at body temperature.

—*Andrew P. Adams, M.D.*

Muscle Relaxants and Cooling Rate in Hypothermic Anesthesia. THEODORE J. MELLINGER. *Ann. Surg.*, 1960, 152: 1078.

THE EXPERIMENTS reported were performed to evaluate the relationship of muscle relaxants to cooling rate in hypothermic anesthesia. Rats, guinea pigs, and rabbits were cooled in an ice water mixture under varying conditions of motor activity and relaxation.

Increasing motor activity and lessened relaxation were proportional to the rapidity of cooling. Animals relaxed under anesthesia cooled at a slower rate than the corresponding unanesthetized animals. Muscular relaxation induced by succinylcholine or tubocurarine increased the cooling time. Both drugs reduced the margin of safety in animals cooled to a core temperature below 30 degrees C. Administration of 10 per cent alcohol, 20 ml./kgm., or chlorpromazine, 6 mgm./kgm., did not change the cooling rate. The results do not support previously published statements that the thermoregulatory defense mechanism must be suppressed to secure proper induction of hypothermic anesthesia.

It is believed that erroneous concepts of the value of muscle relaxants arise when the factors of heat exchange are neglected. The results show that oxygen consumption and heat production play a minor role in the induction of hypothermia by ice water cooling and that the heat exchange on the body shell is the important factor. Lack of circulation on the body's periphery reduces the cooling rate, whereas maximal motor activity and blood flow transforms the body shell into a good heat exchanger.

—*Mary Frances Poe, M.D.*

Brain Damage in Children After Deep Hypothermia for Open Heart Surgery. VIKING OLOV BJÖRK and GÖSTA HULTQUIST. *Thorax*, Lond., 1960, 15:284.

THE EFFECT of deep hypothermia in combination with various methods of extracorporeal circulation was studied in a group of 21 patients subjected to open-heart surgery. The emphasis in this study is placed on changes in the brain which were found to have occurred in a high number of cases. There were 11 deaths in this series and the brain was examined microscopically in 10 instances. Brain damage was the cause of death in 5 children less than 6 years of age but could not be considered responsible for the fatal outcome in any adult patients. Only 2 children, 9 and 10 years old, respectively, survived deep hypothermia, whereas 9 adult patients survived the procedure without neurologic symptoms.

In a group of patients in whom deep hypothermia was obtained by extracorporeal cooling after the method of Drew and Anderson the microscopic changes in the brain were localized predominately to

the globus pallidus and the changes in the cerebral cortex were less pronounced. When deep hypothermia was combined with a pump oxygenator, the cortex and the thalamus dominated the picture and the globus pallidus was insignificantly affected. Disseminated foci and emboli were demonstrated in the brains of patients subjected to surface cooling and extracorporeal circulation and selective cooling of the heart. The aggregation and sequestration of thrombocytes and white blood corpuscles, thought to cause these focal lesions, was not prevented by a high concentration of heparin, 5 mgm./kgm. body weight and an admixture of 500 ml. of low molecular dextran.

The authors believe that in view of the severe brain damage encountered in children operated on both with and without an oxygenator, the use of deep hypothermia by extracorporeal cooling must be reevaluated. —*George R. Holswade, M.D.*

INSTRUMENTS AND APPARATUS

Comparative Reaction of Mersilene and Silk Sutures Implanted Within the Heart. CLARENCE I. BRITT, EDWARD M. MILLER, JR., MARTIN E. FELDER, and HOWARD D. SIRAK. *Ann. Surg.*, 1961, 153:52.

THE AUTHORS report on an experiment in which the use of mersilene for intracardiac suture material is compared with that of silk.

Mersilene sutures have been shown to be less reactive than silk when implanted in the skin, subcutaneous tissues, and fascia. Also, they provide greater tensile strength with a smaller caliber. Open heart procedures require permanent implantation of suture material within the heart for closure of atrial and ventricular septal defects and the repair of cardiotomy incisions. These sutures, acting as foreign bodies, may induce thrombus formation or provoke excessive edema which, if near the ventricular conduction system, may predispose to heart block. Inflammatory changes after suture implantation may result in endocarditis, myocarditis, pericarditis, or abscess formation.

In this experiment early and late, gross and microscopic changes were studied. The tensile strength of the two materials was determined after varying intervals of implantation. By means of proximal inflow occlusion and right atriotomy, interrupted sutures of atraumatic 000 silk and 000 mersilene were placed in the atrial septum of dogs. These two sutures were placed in the same dog, far enough apart in the atrial septum to prevent overlapping of the cellular reaction so that each could be studied separately.

The early gross and microscopic changes appeared to be primarily related to the trauma of placing the suture rather than to a specific response to the suture material. During the first 7 days after implantation, the tissue responses to silk and mersilene in the form of edema and inflammatory changes are essentially the same. Mersilene was found to have several distinct advantages over silk, however: (1) Thrombus formation occurred less frequently on the mersilene than on the silk suture. When a clot developed on both sutures the thrombus on the mersilene was smaller. (2) The amount and duration of chronic inflammatory reaction persisted longer and was more severe around the silk than around the mersilene. (3) Sterile abscesses, associated with a thrombus, were found on the silk sutures 3 to 6 months after implantation, emphasizing the high incidence of granuloma formation with silk. Abscesses were not seen around the mersilene. (4) The size and tensile strength of mersilene are more uniform and constant than those of silk after varying periods of implantation.—*Donald M. Clough, M.D.*

A Rapid Sorting Punch Card for Surgeons. DONALD R. DAVIS and CHRISTOPHER Y. THOMAS. *Missouri Med.*, 1960, 57: 1362.

THE AUTHORS DESCRIBE a rapid key sorting punch card which can be of value to the busy surgeon in private practice and does not utilize special personnel or tabulating machines.

The card was designed with code numbers from the standard nomenclature of operations. The card has 114 punch holes, 41 of which are used for coding operations. The remaining 73 or combinations of these are used for coding other desirable data. Code numbers in the standard nomenclature consist of 2 groups of numbers connected by a hyphen. Numbers to the left of the hyphen locate the operation in terms of anatomy and those to the right indicate the operation performed. On the card the first and second major numbers are on the top of the card and the first, second, and third minor numbers are punched on the bottom of the card.

Key sorting is rapid and easy. Approximately 10,000 6-punch hole cards can be handled in 1 hour, thereby making it easy for a busy surgeon to review his experiences. —*John J. Hudock, M.D.*

RADIOLOGY

DIAGNOSTIC ROENTGENOLOGY

Percutaneous Aortocerebral Angiography. GOFFREDO G. GENSINI and ARTHUR ECKER. *Radiology*, 1960, 75: 885.

ROENTGENOGRAPHIC VISUALIZATION of the arch of the aorta, its branches, that is, the brachiocephalic vessels, and of all of the cerebral arteries, cerebral veins, and jugular veins is possible by injecting the contrast material through a catheter passed into the arch of the aorta proximal to the ostium of the innominate artery. The plastic catheter is passed via percutaneous femoral artery puncture over a flexible coiled spring guide. Five milliliters of 57 per cent hypaque M are injected manually, and the flow is observed by fluoroscopy, preferably with an image intensifier. The patient is then positioned over a rapid film changer and, after injection of 30 c.c. of hypaque in 1 second, a series of 30 films is made, the first 8 films at the rate of 4 per second and the remainder at the rate of 1.5 per second.

In an addendum, the total experience without significant morbidity is reported on 117 aortocerebral injections into 34 patients. This method has the advantage of demonstrating all of the main vessels from the aorta, their bifurcations in the neck, and the vertebral and carotid arteries in a single procedure. In the authors' hands this method has been the most reliable means of performing complete cerebral angiography or even vertebral angiography.

—*Lois Cowan Collins, M.D.*

Angiography of the Superior Sagittal and Transverse Sinuses. LEON MORRIS. *Brit. J. Radiol.*, 1960, 33: 606.

ASSESSMENT of the patency of the superior sagittal and transverse sinuses may be important not only in diagnosis but also in prognosis and treatment of intracranial disease. These sinuses can usually be demonstrated by a film taken 4 to 6 seconds after the commencement of injection of opaque material into the internal carotid artery, in the case of the superior sagittal sinus, and 6 to 8 seconds after the beginning of injection, in the case of the transverse sinuses. The oblique half-axial view with the tube tilted 30 degrees, the head rotated 20 degrees away from the side in which the arterial injection is made, and the central ray centered 1 inch above the orbital margin shows the sinuses to the best advantage.

A study of 100 normal arteriograms was made for the purpose of assessing the roentgenologic anatomic features of these sinuses and also determining the frequency and clarity with which they can be demonstrated in a normal subject. The author has had no experience in a rapid serial device but believes that it would probably provide an even more complete answer to the problem.

In this series approximately 80 per cent of the cases showed satisfactory filling of the superior sagittal sinus when the injection was made into the internal carotid artery, but if the injection was made into the common carotid artery there was satisfactory opacification in only about 40 per cent. The author has found only 18 per cent in which the transverse sinuses were satisfactorily filled but believes that this was because of unsatisfactory timing of the exposure.

The superior sagittal sinus usually drains predominantly to the right transverse sinus and the straight sinus usually drains predominantly to the left. For this reason direct superior sagittal sinus injection may not give as satisfactory a venous sinus study as the films taken after arterial injection.

The study of these sinuses should be particularly applicable in cases of suspected extradural hematoma, meningioma, and sinus thrombosis. It would probably also be of value in cases of hydrocephalus caused by sagittal sinus obstruction and also in assessing jugular vein patency prior to block dissection in the neck.

—*Lois Cowan Collins, M.D.*

Study on the Contrast Medium for Myelography. SHIGEHISA OKAWARA. *Nagoya J. Med. Sc.*, 1960, 23: 136.

IN AN ATTEMPT to find a better contrast medium for myelography, experimental studies using "urokolin" (3-acetylamino 2, 4, 6, triodobenzoic acid) suspended in soybean oil were conducted, using dogs and models of various types of spinal canals composed of polyethylene tubes filled with Ringer's solution. Subsequently, myelographic studies were made of 13 patients. In the latter the quantity injected varied from 1 c.c. to 5 c.c. The disappearance of the contrast medium from the spinal canal, as judged by roentgenography, occurred more quickly with the smaller amounts, ranging from an average of 2.6 days for disappearance of 1 c.c. to an average of 7.8 days for disappearance of 5 c.c. The velocity of movement of the contrast medium in the spinal canal was faster than that of lipiodol, and the opaque material moved as a thin layer rather than as a bolus or in large drops as in the case of lipiodol. The material was found suitable for the diagnosis of disc herniation or spinal tumor.

The irritating effects as measured in the dog by means of blood pressure, pulse rate, and respiration were minimal. Histopathologically hyperemia and slight infiltration of leukocytes were observed 3 days after injection and became minimal 10 days after injection. There were no lesions of the spinal cord in 3 cases. A fourth dog had had 1.5 c.c. injected directly into the central canal of the spinal cord by mistake and destruction of the central canal and surrounding areas occurred. In the dog that was killed 3 days after injection slight hyperemia and infiltration of leukocytes and separation of the pia mater from the spinal cord were noted, but no spinal cord changes. In the dog killed 10 days after injection there was separation of pia mater from the cord and slight thickening of the meninges.

In the clinical study fever was observed in 42 per cent of patients, developing on the second and third day and falling to normal within 5 to 8 days after

myelography. Headache occurred in 47.7 per cent, lumbago in 7 per cent, and nausea and vomiting in 7 per cent. The latter may have been due to the premedication. Serial cerebrospinal fluid cell counts increased on the second and third days and decreased gradually thereafter, paralleling clinical side effects.

The figures with this contrast medium were finer and more detailed than those obtained with previously used media. —*Lois Cowan Collins, M.D.*

Acute Upper Gastrointestinal Bleeding Roentgenologically Considered. GILBERT W. HEUBLEIN, GERALD L. BAKER, and ROBERT H. ROY. *Am. J. Roentg.*, 1960, 84: 1003.

ROENTGENOLOGIC STUDY for bleeding from the upper gastrointestinal tract may offer much of value in management. An emergency nonpalpatory fluoroscopic roentgenographic study is definitely less hazardous to the bleeding patient than exploratory laparotomy when blind search is made for an ulcer crater. It is also definitely less dangerous than esophagoscopy and gastroscopy and should precede rather than follow such procedures. The patient must be conscious and should of course be able to swallow, but otherwise there is no contraindication to this type of roentgen study as soon as the patient's blood volume is stabilized. Information to be gained which is particularly significant preoperatively is: (1) identification of or elimination of varices, (2) establishing the presence of a gastric ulcer, and (3) revealing the presence of a duodenal deformity. In patients managed without operation it is important that the roentgen examination be carried out at the earliest possible moment after apparent cessation of bleeding. Since peptic ulcers heal rapidly, delay in roentgenoscopic examination may interfere with accurate diagnosis.

A review of 166 histories of patients with moderate to severe upper gastrointestinal hemorrhage at the Hartford Hospital, Hartford, Connecticut revealed that 82 per cent were classified as 2 plus bleeders and 18 per cent as 3 plus or massive bleeders. The interval between admission and roentgen study was as follows: in surgical cases there was an average delay of 60 hours and in medical cases 73 hours. Twenty-four per cent of the patients were examined within 24 hours and 64 per cent within 72 hours. The accuracy of roentgen diagnosis was high, on the order of 84 to 85 per cent in both medical and surgical cases. In only 3 patients, 6.4 per cent, was no bleeding point discovered. Five of 8 patients dying after treatment were more than 80 years of age and showed numerous complications not directly related to the cause of the bleeding. Medical and surgical mortality was relatively low, on the order of 4 to 5 per cent, but it seems likely that decreasing the time interval between admission and roentgen study might increase the accuracy of diagnosis and further aid in the reduction of mortality. —*Lois Cowan Collins, M.D.*

Experience with Duodenal Application of Biloptin (Erfahrungen mit duodenaler Applikation von Biloptin). W. BAUMANN, E. BOCK, J. SCHNEEWEISS, and H. J. WICHMANN, *Fortsch. Röntgenstrahl.*, 1960, 93: 212.

THE COMMON OCCURRENCE of biliary tract disease makes an exact clinical and roentgenologic diagnosis desirable, especially in cases in which the usual contrast media cannot be used. After many years of experience the authors concluded that no single preparation was completely satisfactory. The authors introduced "biloptin" (3-dimethyl-methylenamino-2, 4, 6, tri-iodophenylpropionic acid) for visualization of the human gallbladder. The substance was introduced by means of a duodenal tube and found to be highly concentrated in the gallbladder within 40 minutes. No reactions to the substance have been noted. Because of gastric acidity, a longer period of time is required for biliary visualization when the substance is administered orally.

—*Andrew P. Adams, M.D.*

The Roentgen Diagnosis of Submucous Lipomas of the Colon. ALEXANDER R. MARGULIS and ANICA JOVANOVICH. *Am. J. Roentg.*, 1960, 84: 1114.

ROENTGEN EXAMINATION does not usually establish a precise diagnosis in lipoma of the colon. Because the lesion is benign, surgical excision would not be undertaken as a rule except for the uncertainty in diagnosis.

The authors review 8 cases of submucous lipoma. Three of the lipomas were located in the ascending colon, 3 in the cecum, 1 in the sigmoid, and 1 in the descending colon. If the possibility of submucous lipoma is kept in mind, a presumptive diagnosis may be made on the basis of roentgen findings. The tumor has a smooth surface; the outline is sharp on conventional barium enema examination. Very little barium is trapped on the surface of the tumor, so that there is apparent radiolucency on compression spot films, and sometimes great difficulty in demonstrating the lesion in double contrast examination. The surface of the tumor is normal mucosa and the lesion can easily be mistaken for a haustral fold.

There is relatively little difference in the linear absorption coefficients between fat and soft tissue in the higher energy range used in diagnostic roentgenology; however, roentgenograms taken with lower kilovoltage may bring out the difference between fatty and other soft tissue. Barium or air in the bowel defeats the soft tissue technique, but a water enema may be used for the detection of lipoma. Difficulty is encountered with the technique in obese patients. In addition one must be certain that the water enema has reached the area of interest, and spot films must be made with compression and a small field of exposure.

The authors cite studies with phantoms, dogs, and human volunteers, who swallowed fat filled finger cots, to support their views and diagnostic procedure.

—*Carl H. Calman, M.D.*

Extra-Alimentary Gas in Perforated Appendicitis. JAMES J. MCCORT. *Am. J. Roentg.*, 1960, 84: 1087.

DEMONSTRABLE roentgenographic abnormality in a patient with clinical findings of acute appendicitis indicates that the disease is no longer limited to the appendix. The roentgenographic evidence occurs when the infection has extended through the appendiceal wall and there has been perforation with abscess formation or generalized peritonitis. Numerous roentgenographic signs of these complications have been described by various investigators. The demonstration of extra-alimentary gas indicates a perforated

viscus. A review of 648 appendectomies performed in a 7 year period revealed 103 cases in which perforation had occurred. Not all of these cases had been examined roentgenographically, but of those that had, extra-alimentary gas was revealed in 6. In all 6 there had been a delay in treatment ranging from 48 hours to 7 days.

Free intraperitoneal air can be recognized beneath the diaphragm on the upright film, over the liver on the lateral decubitus film, and as an oval radiolucency in midabdomen on the supine films, where it permits recognition of both the inner and outer walls of the bowel. Bacteriogenic gas is manifested by small bubbles in the surrounding exudate and soft tissues. Fluid levels are rare with bacteriogenic gas. These small bubbles may be detected in an abscess adjacent to the cecum, or below the liver or diaphragm. If the appendix perforates retroperitoneally bubbles of gas may appear in the perirenal tissues and the soft tissues of the lateral abdominal wall.

By far the most common cause of free air in the peritoneal cavity is perforation of a peptic ulcer. Extra-alimentary gas resulting from appendiceal perforation is rare. The most helpful signs in establishing the appendix as the site of perforation are: (1) the presence of a coprolith, (2) localized distention of the cecum or the terminal ileum, (3) thickening of the cecal wall, and (4) obscuration of the flank stripe or the lower psoas line. —*Lois Cowan Collins, M.D.*

New Contrast Media for Examination of Biliary Tract (Eigenschaften und Indikationsbereich neuer Gallenkontrastmittel). W. Frik. *Deut. med. Wschr.*, 1960, 85: 1764.

Oral cholecystocholangiography is preferable whenever possible to intravenous methods, which involve the injection of large volumes of highly concentrated substances. The chief problem in getting good exposures with the oral dyes is in the timing of the excretion of the media from the liver into the biliary ducts. Also, in conditions in which there is interference with absorption from the small bowel, such as certain diarrheas, not enough dye is absorbed for visualization.

The functional status of the liver is pertinent to the indications for cholecystocholangiography, but not to the route of administration of the dye. A significant degree of biliary obstruction with jaundice interferes equally with oral or intravenous administration of the contrast medium.

The author has previously reported on his experience with the tri-iodized dyes biliselectan, telepaque, biligrafin, triodan, and others. All of these are for oral use except biligrafin, which is used intravenously. All of these have troublesome side effects, such as nausea, diarrhea, and occasionally dysuria. Previously the two best agents were telepaque and triodan. Telepaque, or iopanoic acid, has an amine group and ethyl propionic acid attached to an iodized aromatic nucleus. Triodan is the same except that its acid is ethyl acrylic acid.

Two new substances have been developed from these nuclei—biloptin, which is a sodium salt of a telepaque (iopanoic acid) modification, and orabilix, or bunamiodyl, a sodium salt of a triodan variation. The author gives these chemical structures in detail.

He used biloptin in 120 cases and orabilix in 60. The results in general were the same: 80 per cent positive cholecystograms, stones demonstrated in 6 per cent, a small percentage with residual contrast medium in the colon. Side effects were definitely reduced compared to the older dyes; only 11 per cent had nausea and 3 per cent diarrhea. There was no dysuria. The visualizations were just as good as but no better than with telepaque.

As for visualization of the biliary ducts, this depends more on the roentgenographic technique than the actual contrast medium used, and also the particular disease state of the patient. Biliary visualization is better if the gallbladder has been previously removed or the cystic duct blocked. Pictures are best taken 2 to 3 hours after the dye is ingested, rather than later. The author obtained just as good cholangiograms with the oral administration of biloptin and orabilix as he did with biligrafin administered intravenously; however, the timing of the exposures is more difficult.

These two new contrast media are an improvement, not because of increased diagnostic results, but because they are better tolerated by the patients.

—*William B. Gallagher, M.D.*

Operative Cholangiography. L. P. Le Quesne. *Proc. R. Soc. M.*, Lond., 1960, 53: 852.

The author primarily devotes this article to the evaluation and discussion of pre-exploratory cholangiograms. He inserts a fine ureteral catheter through the cystic duct and the common bile duct and then injects 3 c.c. of 35 per cent diodrast and exposes the film; injects 6 to 8 c.c. and exposes a second film; and injects 10 to 12 c.c. and exposes a third film. Certain points of technique are important: (1) To avoid obscuring the films, all instruments should be removed from the field of operation and skin towels should not be fixed with skin clips. (2) The table should be tilted 20 degrees to the right before exposing the film to throw the image of the common duct clear of the spine. (3) Bubbles must be carefully excluded from the system. (4) It is essential to expose one film after injection of a small amount of contrast medium in order to see the fine terminal portions of the duct clearly.

In interpreting the films the author states that a normal pre-exploratory cholangiogram should show the following features: (1) The duct must be less than 12 mm. in diameter. (2) There must be a free flow of contrast medium into the duodenum. (3) The terminal narrow segment of the duct must be clearly seen in at least one film. (4) There must be no filling defects. (5) There is no excess retrograde filling of the hepatic ducts. The one exception to these listed demands of a normal cholangiogram is the absence of free flow in the duodenum on the first film. Maintaining these rigid criteria means that there will be no false negatives. False positives, however, may arise from air bubbles in the system or spasm of the sphinteric muscles. Attention to details should obviate the presence of bubbles, and if the duct is normal in all respects, except for the duodenal flow, amyl nitrite by inhalation may be given to produce relaxation of spasm, and a normal cholangiogram results.

In his cholangiograms taken after exploration of the common duct the author finds that the study is not as accurate as the pre-exploratory cholangiogram. Edema around the sphincter after instrumentation cannot be relaxed by amyl nitrite. Exclusion of bubbles is more difficult, and evidences of dilatation which existed prior to removal of the common duct stone naturally still remain. The most important finding, therefore, in a postexploratory cholangiogram is a defect in filling.

—*Ward D. O'Sullivan, M.D.*

ROENTGEN AND COBALT TELETHERAPY

The Treatment of Brain Tumors with Radioactive Cobalt (Die Behandlung von Hirntumoren mit radioaktivem Kobalt). W. Tönnis and O. Wilcke. *Acta neurochir.*, Wien, 1960, 8: 456.

Sixty-eight patients with malignant brain tumors were treated with radioactive cobalt 60. The cobalt was placed in the tumor cavity at the time of operation. The patients were divided into 4 groups, each group being given a different dose. Seventy-five mc. left in the cavity for 24 or 48 hours appeared to result in a shorter survival time and an increased incidence of difficulties with wound healing. One hundred and fifty mc. of cobalt 60 left in the tumor bed for 6 hours produced a tumor dose of 3,000 to 5,000 r for a distance of 1 to 2 cm. The results were worse than with the standard methods of operation and irradiation. Seventy-five mc. left in place for 10 hours was no more effective than the larger doses. The authors believe that inclusion of the entire tumor within the area of radiation is doubtful, even with the highest doses, when this method is used.

—*Sanford Larson, M.D.*

IRRADIATION INJURIES

Postirradiation Fractures of the Femoral Neck. William H. Bickel, Donald S. Childs, and Charles M. Porretta. *J. Am. M. Ass.*, 1961, 175: 204.

In this study of a relatively few (24) postirradiation fractures of the neck of the femur an effort was made to determine what type of treatment should be given. It was evident that these fractures heal with conservative treatment, in this series in 13 of the 24 instances. Simple internal fixation with pins, a triflange nail, or a bone graft accomplished union in 8 additional patients, resulting in union in 21 of the 24 hips. Union in a varus position might have been avoided by earlier treatment and fixation. The time elapsing between treatment with roentgen rays and occurrence of fracture varied greatly. Symptoms of pain in the hip and limp indicated a fracture or an impending fracture. Metastatic lesions from the cervix and uterus to the neck of the femur appear to be rare.

Surgical Prophylaxis of Radiation Cancer (Der Roentgenkrebs im Hinblick auf seine chirurgische Prophylaxe). R. Geissendörfer. *Langenbecks Arch. klin. Chir.*, 1960, 294: 456.

The author presents 14 cases of radiation ulcer treated by radical excision. All proved to be benign and none recurred over a 9 year period.

Early radical excision of roentgen ray-induced ulcers is a worthwhile form of cancer prophylaxis. Over a period of time most radiation ulcers will undergo malignant degeneration, usually to a squamous cell carcinoma. The prognosis, even with radical removal, is poor.

The author urges that radiation therapy be limited to treatment of malignant lesions and that other methods be used for benign skin conditions. Small as it is, the incidence of radiation cancer does not justify casual roentgenotherapy.

—*William B. Gallagher, M.D.*

Leukemia Following Radioiodine Treatment of Thyrotoxicosis. E. Eric Pochin. *Brit. M. J.*, 1960, 2: 1545.

At least 60,000 patients with thyrotoxicosis have been treated with radioiodine during the past 20 years, and 18 cases of leukemia are known to have occurred in this group. A questionnaire study of 47 clinics in the United Kingdom using radioiodine therapy revealed that more than 13,000 patients were treated in this way up to mid 1960, involving a total of more than 38,000 patient years since treatment or a mean follow-up of approximately 3 years. The expected incidence of leukemia on the basis of chance is 2.8 cases and does not differ significantly from the observed leukemia incidence of 3 cases in this group of patients. Because of the limited numbers of cases observed in the United Kingdom, an attempt was made to assess the radioiodine experience and associated leukemia incidence in the United States, Canada, and Austria by a similar study method. These patients then comprise the remainder of the 60,000 treated and represent a minimum estimate of both patients treated and leukemia incidence in these patients. In a similar fashion to the United Kingdom statistics, these other countries have a reported leukemia incidence in patients treated with radioiodine which does not differ significantly from the expected leukemia incidence. Moreover, the intervals between such treatment and the diagnosis of leukemia are randomly distributed. This study indicates that radioiodine treatment of thyrotoxicosis does not induce leukemia.

—*Stuart L. Scheiner, M.D.*

SURGICAL TOPICS OF GENERAL INTEREST

ETIOLOGIC AND PHYSIOLOGIC RESEARCH

Erythrocytosis or Symptomatic Polycythemia Following Chronic Cerebral Stimulation Through Indwelling Electrodes. J. F. KELL, JR., E. C. HOFF, and G. R. HENNIGAR. *J. Neurosurg.*, 1960, 17: 1028.

THE AUTHORS have designed a series of experiments to determine whether the medial hypertrophy and hyperplasia of the cat's pulmonary arteries due to repeated stimulation of cerebral autonomic centers by pentylenetetrazol (metrazol), which they have previously reported, were associated with erythrocytosis. In addition, it was desired to establish whether the arterial vascular changes and erythrocytosis could be produced by chronic focal electrical stimulation of the cerebral autonomic centers.

Six cats were given repeated subconvulsive doses of intramuscular metrazol. In 4 of the 6 a rise in red blood cell count developed and increased hematocrit and hyperplastic bone marrow. In all 6 of these animals there was some degree of pulmonary vascular change.

Seven cats and 8 dogs received chronic stimulation to the prefrontal and pyriform areas of the cortex. Four of the 7 cats and 6 of the 8 dogs were found to have erythrocytosis, hyperplastic bone marrow, and an increase in blood volume. Medial hypertrophy and hyperplasia in the pulmonary vascular bed was seen in 4 of these cats but in none of the dogs.

On the basis of these results as well as reports by others it is postulated that the polycythemia associated with brain tumors in man is caused by chronic stimulation of vasomotor centers in the brain and is not produced by some distinctive characteristic of the neoplasm itself. —*Robert G. Ojemann, M.D.*

Hyponatremia and Renal Wasting of Sodium in Patients with Malfunction of the Central Nervous System. MARTIN GOLDBERG and JOSEPH S. HANDLER. *N. England J. M.*, 1960, 263: 1037.

THIS REPORT concerns the observations made on 4 patients with manifestations of abnormal function of the central nervous system, in whom hyponatremia appeared to be related to an abnormal secretion of antidiuretic hormone. The abnormal central nervous system findings were those of disorientation, coma, hemiparesis, and ataxia. All were thought to be caused by intracranial lesions, either neoplastic or vascular, or by toxic or metabolic factors. All of the patients were 59 years of age or older.

None of the patients had the clinical signs of sodium depletion with dehydration, peripheral vascular collapse, and azotemia. Edema or ascites was not present in any of the patients nor was there any evidence of adrenal insufficiency.

Since these patients had no evidence of salt loss or signs of dehydration, another mechanism was sought. The most likely would appear to be an abnormal secretion of the antidiuretic hormone which can be controlled by either an excessively high salt intake or a restriction of fluid intake, and the latter was chosen as the best method of therapy in these patients.

This hypothesis seems tenable in that these patients had a serum osmolality lower than the urine osmolality, and this is generally accepted, in the presence of normal glomerular filtration, as evidence for activity of antidiuretic hormone. The reason for the abnormal release of antidiuretic hormone is unknown, but none of the patients showed evidence of a lesion in the hypothalamic pituitary area.

A summary of the cases and presentation of the metabolic data are included in the paper.

—*John H. Davis, M.D.*

Pulmonary Embolism. DAVID PHEAR. *Lancet*, Lond., 1960, 2: 832.

THIS IS A STUDY of the late prognosis in pulmonary embolism. Of 136 cases diagnosed, 71 patients survived the embolus and 68 of this group were reviewed. Forty-two of the patients had recovered completely. Ten of the patients were severely disabled.

Of this group of 10 patients, 2 had a clear picture of pulmonary hypertension and right ventricular failure. Exertional dyspnea and fatigue were the outstanding symptoms. Seven patients in this group had recurrent embolism. A detailed history of 3 of the patients is presented.

The possible development of right-sided heart failure with recurrent or multiple emboli to pulmonary arterioles should be considered. The author believes that early diagnosis is important so that anticoagulant therapy can be initiated. Two of the patients reported on in this group seemed to have been benefited by anticoagulants. Inferior venacaval ligation should be considered when embolization persists.

—*Richard L. Lawton, M.D.*

The Significance and Classification of Fat Embolism. SIMON SEVITT. *Lancet*, Lond., 1960, 2: 825.

THIS REPORT is an analysis of 100 patients dying after injury and 17 with clinical fat embolism. The author noted that there is a variety of severity of fat embolism, some rapidly fatal cases and others detected only at necropsy.

Pulmonary fat embolism is not uncommon in those patients dying after traumatic injuries. It would seem that even large quantities of embolic fat in the lungs produce very little functional impairment. This obtains even though patients may be in shock.

Of greater significance from the standpoint of prognosis is the presence of systemic fat embolism. Of the 100 patients examined, 24 per cent had systemic embolism, 89 per cent had pulmonary embolism, and all patients with systemic emboli had pulmonary emboli. Systemic fat embolism includes those cases with cerebral, cutaneous, or renal embolism. Systemic embolism correlates with the severity of the bony injury.

Systemic embolism was classified as follows: (1) fulminating cases, (2) classical or full syndrome, and (3) a number of incomplete or partial syndromes. In the

fulminating cases death ensues in 1 to 3 days. It is believed that cerebral embolism is responsible for this type of clinical course. The second section of the classification is called the classical syndrome and is characterized by cerebral and neurologic involvement, respiratory symptoms, pyrexia, and a petechial eruption. The mortality in this group is fairly high. The last group in the classification comprises those with incomplete and partial syndromes. There are three sub-groups: those without respiratory symptoms but with cerebral and neurologic symptoms; those without cerebral symptoms but with respiratory distress, pyrexia, tachycardia, and petechial rash; and those without significant cerebral or respiratory symptoms but with petechial rash.

When no rash is present the diagnosis is difficult to make. The finding of fat in the sputum is common but reflects only pulmonary embolism. Urinary examination for fat has been found to be unreliable. Rapid frozen section of renal biopsy material may be of great help in those cases in which the diagnosis cannot be established.

Pulmonary embolism of fat is common after trauma. Prognosis is dependent on the severity of cerebral symptoms. A number of cases of systemic fat emboli are undiagnosed. Some patients seem to tolerate embolic fat in the brain fairly well.

—*Richard L. Lawton, M.D.*

Fever in Malignant Neoplastic Disease. Dane R. Boggs, Emil Frei III, and Charles H. Zierdt. *Ann. Int. M.*, 1960, 53: 754.

This article reports a controlled study of patients with neoplastic disease who also have elevated temperature. Patients in the treated group were given a tetracycline and those in the control group a placebo.

It is known that patients with neoplastic disease at times manifest elevated temperature without obvious bacterial invasion. It is believed by some investigators that occult bacterial invasion may account for the fever, and this study was designed to test this hypothesis. Attempt was made to exclude patients with overt infection. The two programs were randomized into four categories of neoplasms.

Fever of undetermined origin was not favorably influenced by antibiotic therapy. Infection developed in a greater proportion of patients on antibiotic therapy than in those receiving a placebo. The authors quote from a number of articles that support the contention that prophylaxis of nonspecific bacterial infections has not been successful. The infections that did occur during a course of antibiotic therapy were more severe than those occurring during placebo treatment. There was an unfavorable alteration in the bacterial flora of the various systems tested.

The authors conclude that in patients with fever of undetermined origin a course in antibiotic therapy is not indicated. —*Richard L. Lawton, M.D.*

Occupational Trauma and Skin Cancer. Christopher R. Dix. *Plast. & Reconstr. Surg.*, 1960, 26: 546.

Traumatic cancer of the skin appears to be a reality. The increasing number of new chemicals and compounds developed in industry exposes workers to new and unknown carcinogens. Some of the carcinogens cause cancer and others form carcinogenic substances within the tissues. Ewing's criteria appear adequate for the fulfillment of the diagnosis of traumatic cancer of the skin.

Since 1942, 25 patients with 27 skin cancers have been examined and treated. All of these fulfilled the aforementioned criteria. All of the cancers were basal cell carcinomas and 2 of these had squamous cell elements as well. The cause was trauma from welding or hot metals in all instances. Pathologic diagnosis, proper excision, and repair of the defect was the method of treatment. Results were good and the prognosis is considered good.

Thorough pre-employment and periodic physical examinations and accurate records are a necessity in industries which use or produce carcinogens. Any traumatic wound of this sort which does not heal must be considered as possibly malignant and proper diagnosis and excisional therapy used in its management.

—*Donald C. Geist, M.D.*

The Examination of Thyroid Activity with Radioiodine. E. Eric Pochin. *Brit. J. Radiol.*, 1960, 33: 595.

The main groups of tests reviewed comprise: the tests for thyroid overactivity, based on the uptake of the thyroid gland or on the initial partition between the thyroid and the kidneys of a dose of radioiodine administered in the form of iodide; the tests concerned with hormone discharge from the thyroid gland; and some other measurements including those of the gland's response to therapeutic agents.

In discussing the thyroid overactivity tests, the author expresses the opinion that tests which measure the thyroid uptake within a few hours of the administered dose or are based on the initial rate of uptake give more conspicuous evidence of the abnormality in thyrotoxic patients than the 24-hour uptake tests, although decreased function is better identified by 24-hour uptake tests. This advantage is independent of the difficulty introduced by the early discharge of labelled hormones from some overactive glands. It also permits the use of short-lived radioiodines, as for example I^{132}, especially in pregnant women and children, or when repeated tests are necessary. With I^{132} equal information can be obtained at about one-fiftieth the adult thyroid radiation dose in a 2-hour uptake measurement as compared with I^{131}.

In connection with the thyroid overactivity tests the author also analyzes the purely stastistical approach, in which parameters raised in thyrotoxicosis are divided by others that are lowered, so as to obtain a greatly increased ratio in such patients. Examples of this are: the ratio of 24-hour thyroid uptake to 24-hour urinary output; the "T" index of urinary excretion; the 2-hour ratio of neck to thigh counting rates; the "conversion ratio" between plasma protein-bound radioiodine and radioiodide concentrations in plasma; and many others. The use of such ratios requires scrutiny on statistical grounds, since it is not the increase of index which is of diagnostic importance but the relationship between this increase and range of scatter of control values for the same index.

When the whole group of thyroid uptake tests is considered, it is obvious that they reflect more or

less directly either the thyroid clearance rate or the ratio between thyroid and renal clearance rates. Other factors assume a secondary importance. The validity of such tests is therefore determined by the relationship between the iodide clearance rates which are measured or estimated and the increase in hormone metabolism which one wishes to evaluate.

In considering the tests concerned with metabolization of the thyroid hormone, the author discusses fully the iodine metabolic cycle, showing relationship between dietary intake and urinary output, and the basis for estimating the thyroxine utilization rates from thyroid uptake of radioiodine, with sources of error due to abnormal levels of plasma iodide, lack of thyroid equilibrium between iodine uptake and discharge, output of metabolites other than thyroxine, and abnormal thyroxine loss. He emphasizes that in using the radioiodine uptake of the thyroid gland as a quantitative index of metabolic activity of the gland there are a series of assumptions the significance of which must be kept in mind. The group of output tests depending on the rate with which radioiodine passes through the thyroid gland and appears in hormonal form in the plasma are detailed.

Other measurements reviewed are: the radioiodine uptake of functioning thyroid cancers and their proportional discharge rate of iodine, which is even greater than in hyperthyroidism; the uptake after administration of various drugs; the red cell radioactivity observed after equilibrating a plasma sample with labelled tri-iodothyronine in vitro; and the uptakes in goiter due to enzyme or other metabolic defect, commonly seen in childhood, in which the use of I^{132} is of definite advantage.

—T. Leucutia, M.D.

Effect of Hypothermia on Cerebral Damage Resulting from Cardiac Arrest. KENNETH B. WOLFE. *Am. J. Cardiol.*, 1960, 6: 809.

THE APPLICABILITY and success of cardiac resuscitation techniques depend on the period of time that the brain can endure anoxia without suffering irreversible damage. In cerebral anoxia the nerve cells are deprived not only of oxygen but also of dextrose and the products of metabolism are not removed. Cerebral damage from anoxia is manifested by edema which progresses until there is a fatal destruction of cells. Hypothermia is effective in reducing the cerebral edema and has been recommended as a means of preventing neurologic injury or decreasing its severity. Hypothermia produces a decrease of cerebral blood flow, a corresponding reduction of cerebral metabolism, "compensated" hypotension, a decrease of brain volume, a diminution of intracranial pressure, a depression of electrical and reflex activity, and a safety factor against the consequences of prolonged temporary or permanent interruption of vascular channels.

In his present study the author utilized 10 mongrel dogs in which ventricular fibrillation was induced at thoracotomy. Exactly 5 minutes after the onset of ventricular fibrillation the circulation was restored by open heart massage and defibrillation. At this point oxygen was given by an adequate airway. As soon as a co-ordinated beat producing adequate blood pressure was obtained, cooling was initiated. Two hours were usually required to lower the rectal temperature to 31 degrees C., and cooling was maintained at this level for 24 hours. Intravenous dextrose was given throughout the period, and shivering was controlled by various drugs. Ten control animals were similarly treated, but no cooling was induced.

The results of the experiment were that 3 of the 10 dogs survived without any cerebral damage, 4 of the 10 cooled dogs had their lives prolonged by cooling but died, 22, 31, 120 and 192 hours after cerebral anoxia. Three of the cooled dogs showed no protective effect by cooling and died, 24, 40, and 46 hours, respectively, after cerebral anoxia. All of the 10 control animals, not cooled, died from 1 to 65 hours after the onset of cerebral anoxia.

—Wayne F. Cameron, M.D.

Heat Production from Shivering. P. F. IAMPIETRO, J. A. VAUGHAN, R. F. GOLDMAN, M. B. KREIDER, and Others. *J. Appl. Physiol.*, 1960, 15: 632.

THE PURPOSE of this study was to determine the maximum rate of heat production from shivering, to establish those ambient conditions which evoke the maximum heat production, and to determine the relative effects of wind speed and dry-bulb temperatures on heat production. The conclusion of this study is that the maximum heat production from shivering cannot be evoked merely by exposing nude men to low dry-bulb temperatures without also having a wind of at least 10 mph. This may be due to the fact that exposure to a given temperature with minimal wind gives a higher skin temperature than when wind speed is high. There is less of a surface stimulus for shivering when wind speed is low. The maximum heat production from shivering is about five times resting heat production or about 425 Cal./hr. There seemed to be no relationship between the time necessary to reach peak heat production and body composition, i.e., several individuals with a high body fat increased heat production more rapidly than others who were relatively lean. When heat productions on the order of 400 Cal./hr. were observed, the subjects were shivering violently and uncontrollably. It is doubtful that a greater shivering response could be evoked under circumstances other than those described in this article.

—Harold M. Unger, M.D.

Central and Peripheral Control Mechanisms of Shivering and Its Effects on Respiration. THOMAS P. K. LIM. *J. Appl. Physiol.*, 1960, 15: 567.

IT HAS BEEN DEMONSTRATED that both the hypothalamic and subcutaneous temperatures participate in the initiation of thermal panting in the anesthetized animal during induced hypothermia. This has led to a desire to learn whether this dual operation also operates at the onset of shivering or whether it differs in shivering from thermal panting. Employing carotid cooling or warming techniques by which the temperatures of the head region or body could be altered independently the author attempted to delineate the role played by the central and peripheral factors.

Shivering was produced by reducing the mean hypothalmic temperature alone from 38 degrees to 36.2 degrees C. The author concludes that thermal influx from the periphery in the cold plays a more

dominant role than a warm environment. Furthermore, the termination of central shivering by skin warming and that of peripheral shivering by brain warming as demonstrated by this study verifies the presence of a close association between the two mechanisms during shivering, thus corroborating the general premise of a dual thermoregulatory mechanism in the mammalian body. The data show that shivering does not necessarily alter the gas exchange ratios during steady states of breathing and body temperature. It is the general conclusion that the peripheral mechanism for the initiation of shivering plays a predominant role and is probably more potent than central temperature changes. As far as energy expenditure is concerned, the central mechanism is approximately 3 times as powerful as the peripheral one. —*Harold M. Unger, M.D.*

CANCER RESEARCH AND CHEMOTHERAPY

The Experimental Production of Adenocarcinoma of the Stomach in Rats. STANLEY C. SKORYNA and A. C. RITCHIE. *Gastroenterology*, 1960, 39: 737.

ADENOCARCINOMAS were induced in the glandular stomach of rats by implanting threads impregnated with 20-methylcholanthrene into the stomach. Two impregnated cotton threads were implanted in the submucosa of the glandular portion of each stomach at the start of the experiment. Three months later two more threads were placed in the submucosa of the glandular portion of each stomach, and 3 months later still, a fifth and sixth thread were implanted in the stomachs. The threads were introduced into the gastric wall by means of a straight cutting needle. Five holding silk sutures through the whole thickness of the gastric wall were placed around each thread in order to prevent its expulsion into the gastric lumen. By this means, adenocarcinomas or adenoacanthomas were induced in 21 per cent of the last series of rats studied and sarcomas in 20 per cent. Diverticula of the glandular stomach occurred at the site of implantation of the threads in the majority of the rats studied.

This report is well illustrated with impressive microphotographs illustrating the lesions produced. The method appears to be a very suitable one for further studies of factors modifying gastric carcinogenesis.
—*Lloyd D. MacLean, M.D.*

Intra-Arterial Radioisotopes to Treat Cancer. EDGAR D. GRADY, WALTER SALE, WILLIAM PERRIN NICOLSON, JR., and LUTHER C. ROLLINS. *Am. Surgeon*, 1960, 26: 678.

YTTRIUM^{90} particles 30 to 100 microns in diameter were prepared by placing the particles of yttrium oxide of known diameter in the pile. The particles were then suspended in 12.5 per cent dextran and injected into rabbits. Of the particles injected into the renal artery 40 to 70 per cent were trapped by the kidney. A similar per cent were trapped by the thigh muscle when injected into the femoral artery. Microscopic sections were made a few days later and radiation-induced changes were studied. Two and one-half to 16 millicuries were injected. Cellular changes were slight.

The authors suggest that the method be tried on lesions of the extremity, pelvis, lung, oral cavity, and abdomen. —*William T. Moss, M.D.*

Control of Treatment in Malignant Diseases by Serum Antitrypsin and Antirennin Determinations (Ferment- und Antiferment-Verlaufskurven als Richtlinien bei Behandlung und Kontrolle der Malignomkrankheiten). A. G. AUDIER. *Med. Welt*, 1960, p. 1763.

THE AUTHOR STUDIED plasma antichymotrypsin and plasma antirennin levels in 400 patients with cancer. West and Hilliard reported in 1949 that these ferments parallel the growth activities of tumors and provide early information as to the effects of treatment. Antichymotrypsin (ACT) levels rise from normal levels of 100 to 110 units to 200 units when a tumor is growing; the higher the ACT, the stronger the tumor activity. The antirennin (AR) level indicates the resisting power of the organism and these levels drop when treatment is failing, to the 80 to 100 unit range. The values are relative, the determinations complicated, and the general curve of repeated measurements is more important than absolute values.

Normal ACT and normal AR indicates a symptom-free, disease-free status.

Normal ACT and elevated AR is a defensive phase after operative, roentgenologic, or chemical treatment of tumor. Normal ACT with a falling AR is often the first phase of renewed tumor activity. Elevated ACT with an elevated AR shows slow tumor growth. Elevated ACT with a normal AR indicates active tumor growth. Elevated ACT with a falling AR means strong tumor growth.

These results were so consistently borne out in 400 cancer patients that the author believes the tests are reliable indications. Repeatedly, patients who looked good clinically but had unfavorable curves showed early tumor recurrence. Conversely, patients with known advanced disease sometimes had favorable curves and did respond well to palliative measures.

The practical value is that if these tests show unfavorable curves immediately after treatment, other measures can be instituted early and perhaps more effectively. —*William B. Gallagher, M.D.*

Chemotherapy of Human Solid Tumors with 5-Fluorouracil. WILLIAM L. WILSON. *Cancer*, 1960, 13: 1230.

SIXTY-SEVEN PATIENTS with a variety of malignant tumors were treated with 5-fluorouracil (5-FU). The initial dosage was 12 mgm. per kgm. of body weight daily for 5 days. After a brief period during which toxicity was observed, administration of the drug was resumed with a dose of 15 mgm. per kgm. of body weight for another 4 to 5 days. The most common side effects were anorexia, nausea, and vomiting. Ulcerative stomatitis, which may occur initially as vesiculation rather than ulceration, was noted to appear before diarrhea ensued. Watery diarrhea, the most disturbing complication, was considered an indication for withdrawal of the drug. Alopecia occurred in a few patients, and transitory granulocytopenia and thrombocytopenia have been reported.

The results indicate that 5-fluorouracil has definite antineoplastic activity. An exact evaluation of the

antineoplastic activity of this agent will depend on carefully controlled comparative studies. Because of the delayed manifestations of toxicity, it is probably advisable to wait 3 to 4 days after the initial 5 doses before further 5-FU is given.

—*Harold Laufman, M.D.*

Clinical Evaluation of a New Alkylating Agent, Cytoxan. PETER R. COGGINS, ROBERT G. RAVDIN, and SYLVAN H. EISMAN. *Cancer*, 1960, 13: 1254.

THIS WORK presents clinical experience with 143 patients with disseminated cancer treated at the Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania. A new alkylating substance, cyclophosphamide, was used in a wide variety of solid and lymphogenous cancers.

From the data presented it appears that cyclophosphamide may possess an antitumor efficacy of a somewhat greater magnitude than that of the standard alkylating agents currently in use. This agent, belonging to the group of phosphorylated mustards, has effected objective regression of disease in approximately 35 per cent of evaluable patients with terminal cancer. This effect, along with the relative ease of administration, minimal toxicity, and wide therapeutic index, predicts wider investigation of this drug.

Data on two dosage regimens are presented, one employing an initial 6 day course followed by weekly maintenance therapy and one utilizing successive massive single injections. —*Harold Laufman, M.D.*

Endoxan-Asta Chemotherapy. N. BLIXENKRONE-MØLLER. *Acta chir. scand.*, 1960, 119: 389.

AN EXPERIENCE with the use of endoxan for cancer chemotherapy during and after operative procedures on 101 patients is described. This drug is a derivative of nitrogen mustard and has qualitatively the same toxic properties. At laparotomy a dose of 100 mgm. was injected into a tributary of the portal vein in 57 patients. In other patients especially in the presence of peritoneal carcinomatosis, endoxan was injected intraperitoneally at the end of the operation. Postoperatively, the administration of the drug was continued intravenously and orally and an attempt was made to give a total dose of 4,000 to 8,000 mgm.

Of these 101 patients 19 died before the conclusion of the therapy. In 10 cases treatment was discontinued because of severe subjective side effects such as nausea, vomiting, and mental aberration. In 9 cases it was discontinued because of severe bone marrow depression and leukopenia. Endoxan was thought to be a contributory cause of death in 1 patient in whom severe leukopenia developed.

The author maintains that this drug was useful because the general condition in some of the inoperable patients was better after treatment than might have been expected. In 1 case of nonresectable carcinoma of the rectum considerable regression of the tumor was observed after injection of endoxan into the superior hemorrhoidal artery during operation and continued parenteral and oral therapy postoperatively. The author points out that although it is unlikely that this drug would have an appreciable effect on inoperable carcinomas, on it may be useful in preventing recurrence of operable tumors. —*John W. Braasch, M.D.*

The Principle of Transport-Form and Work-Form in Chemotherapy of Cancer Using Endoxan (Die Chemotherapie des Krebses nach dem Prinzip Transportform—Wirkform am Beispiel Endoxan). O. HAMMER and G. ENDERLEIN. *Med. Welt*, 1960, p. 1750.

CANCEROCIDAL DRUGS capable of destroying tumors also injure normal proliferative tissue such as bone marrow, lymph, sperm, intestinal epithelium, and endocrine tissue. Also, expanding tumors outgrow their own blood supply and blood-borne drugs cannot reach the tumor in adequate concentration.

Research is now developing drugs which are biologically inactive and readily absorbed and which liberate potent cytotoxic agents within the body, this change ideally occurring in the malignant cells themselves. Druckrey and Raabe have called this the transport-form and the work-form of a chemotherapeutic agent. The first example of this principle was stilbestrol diphosphate in prostatic carcinoma; the high concentrations of acid phosphatase in the prostatic cancer free the work-form, or active component stilbestrol, within the malignant cells themselves.

Nitrogen mustard, which is potent but unspecifically cytotoxic can be inactivated by phosphorylation; the enzyme phosphatase liberates the active substance. A product of this process is endoxan, a cyclic phosphamide ester of bis-B-chlorethylamine.

The authors treated 45 patients with endoxan at the Karl Marx University Hospital in Leipzig, Germany. All the patients were considered incurable; half had had palliative operations or treatment with some other cytostatic drug. There were 24 bronchial carcinomas, 6 stomach carcinomas, 2 lymphomas, and cancers of vagina, colon, prostate, liver, pancreas, and esophagus, all recurrent or with distant metastases.

Endoxan was given in total dosage of 5,000 to 7,000 mgm. over 25 to 60 day periods. Daily doses started at 100 mgm.; if tolerated, it was increased to 200 mgm. a day, given intravenously. Some patients with stomach cancer took the drug orally in addition.

Four bronchial carcinomas of 24 decreased in size roentgenologically. One disappeared entirely. A lung metastasis from a seminoma shrank. A primary liver carcinoma became smaller. Neck nodes in a patient with lymphoma decreased in size. Most of the patients with stomach cancer with stenosis and obstruction improved and could eat again. A third of the patients who had been taking opiates felt enough better to discontinue narcotics.

While receiving endoxan, most of the patients complained of fatigue and anorexia and lost weight. These side effects appeared with the higher doses of over 200 mgm. per day. Lowering the dose and giving antiemetics helped. Treatment had to be discontinued in only 2 cases. Children also tolerated endoxan well.

Increasing the total dose to more than 7,000 mgm. increased the side effects but apparently added nothing to results.

In general, the intravenous route seems to be the best; however, in stomach carcinomas the combination of oral and intravenous endoxan is effective. This combination does not permit increasing the maximal daily dose, however. Two malignant pleural effusions from bronchial carcinoma were treated with intra-

venous and intrapleural endoxan and improvement followed.

Endoxan did not affect erythropoiesis or platelet counts. Given in adequate doses it does depress the leukocyte count; in fact, a decrease in leukocytes to around 3,000 indicates a desirable end-point in therapy. If the leukocytes do not decrease, enough endoxan has not been given. After the drug is stopped, the leukocyte count always returned to normal; there was no agranulocytosis.

The authors believe endoxan to be a useful chemotherapeutic agent. —*William B. Gallagher, M.D.*

HOSPITAL AND MEDICAL EDUCATION

The Interrelationship of the Department of Plastic and Reconstructive Surgery and the Division of Surgery in the Medical School. EDWIN H. ELLISON. *Plastic & Reconstr. Surg.*, 1960, 26: 312.

IN THE BELIEF that a surgical specialty with such broad interests as the discipline of plastic surgery should be encouraged to contribute to the continued growth and reputation of general surgery, this surgical department was one of the nine provided for in the reorganization of the Division of Surgery at Marquette University School of Medicine, Milwaukee, Wisconsin. The objectives of each department parallel those of the entire division and include excellence in care of the patient as the primary goal. The teaching of medical students to be good physicians, the training of physicians to become excellent surgeons, and the training of highly qualified young men with an interest in academic surgery to insure the excellence of care of the patient in the future follow in order. In addition, research is encouraged in medical students, is mandatory for residents, and is expected of the teaching staff in all fields. To accomplish these objectives a plan of general organization was made which gave equal representation to each of many surgical specialties within the several teaching hospitals as well as the medical school. Thus a Surgical Executive Committee is formed which meets monthly to discuss over-all policy of the Division of Surgery. Membership of this committee includes the chairman of each specialty including plastic surgery. The individual departments have been encouraged to develop their own organization to assure a satisfactory teaching program and to maintain adequate clinical material not only for their own specialty but for general surgery as well.

The Department of Plastic Surgery with the chief plastic surgeon as chairman includes the professor of oral and maxillofacial surgery from the Marquette School of Dentistry. Additional members of the department include 4 assistant professors; 2 instructors, at least 2 residents from the general surgery program, and a resident in plastic and reconstructive surgery. The plastic surgery program spreads across 4 hospitals. Formal teaching commitments for the Department of Plastic Surgery include 6 lectures given during the first 3 years of medical school. Members of the plastic surgery department participate regularly in the preceptor program and clinical clerkships for the junior students assigned to surgery.

The general surgical resident absorbs experience in plastic surgery, first as a junior house officer and again as an intermediate resident. The patient load is adequate to support an approved residency in plastic surgery while continuing to offer experience in this important specialty to the general surgical resident. The plastic service in each hospital participates in scheduled hospital conferences with staff, house officers, and students in attendance. Plastic surgery problems are presented throughout the year at the Marquette surgical rounds and at the weekly surgical grand rounds at each hospital. Similar procedures are carried out at the Veterans Hospital. The plastic surgery faculty also participates in the course in surgical anatomy for first year residents, serving as moderators for sessions on the forearm, the hand, and the maxillofacial area.

The Department of Plastic Surgery plays a major role not only in undergraduate teaching and postgraduate training but also in research and postgraduate education for the practicing physician. This role is indicated by their active participation at national meetings, their many publications, and their extensive research projects. Last, the Department of General Surgery at Marquette recognized responsibility for offering basic instruction in surgery for those specialties requiring a background in general surgery. Of the 38 general residents at present engaged at Marquette University, 3 have indicated their aspirations to continue their postgraduate studies in plastic surgery.

Through these many different facets and activities is shown the close interrelationship that exists between the Department of Plastic Surgery and the Division of Surgery at this University.

—*Carl Schiller, M.D.*

International Abstracts of Surgery

Surgery, Gynecology & Obstetrics

LOYAL DAVIS, *Editor*

Associate Editors

WALTER W. CARROLL · F. JOHN LEWIS
JAMES T. PRIESTLEY · NICHOLAS WETZEL

Consulting Editors

UNITED STATES AND CANADA

SAM W. BANKS · OSCAR CREECH, JR.
J. ENGLEBERT DUNPHY · TOMMY N. EVANS
MINOT P. FRYER · DEAN M. LIERLE
WILLIAM P. LONGMIRE, JR. · ANGUS D. McLACHLIN
S. W. MOORE · WILLIAM H. MULLER, JR.
JOHN J. MURPHY · BRONSON S. RAY
KEITH P. RUSSELL · PAUL C. SAMSON
H. WILLIAM SCOTT, JR. · DAVID SHOCH

GREAT BRITAIN

IAN AIRD · HEDLEY ATKINS
JOHN BRUCE · W. ARTHUR MACKEY
SIR JAMES PATERSON ROSS

ARGENTINA CARLOS A. TANTURI
AUSTRALIA KENNETH W. STARR
DENMARK E. DAHL-IVERSEN
FRANCE JEAN-LOUIS LORTAT-JACOB
ITALY PIETRO VALDONI
NORWAY CARL SEMB
SWEDEN PHILIP SANDBLOM
URUGUAY PEDRO LARGHERO YBARZ

JUNE 1961